BY series

OPERATION MANUAL

4BY2
6BY2

P/N: 0ABY0-G00200

YANMAR

MARINE ENGINES

Disclaimers:

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INTRODUCTION

Welcome to the world of Yanmar Marine! Yanmar Marine offers engines, drive systems and accessories for all types of boats, from runabouts to sailboats, and from cruisers to mega yachts. In marine leisure boating, the worldwide reputation of Yanmar Marine is second to none. We design our engines to respect nature. This means quieter engines, with minimal vibrations, cleaner than ever. All of our engines designed after 1996 meet most of the present and future emission regulations, such as BSO II, SAV, EPA II, IMO and RCD.

To help you enjoy your Yanmar BY2 engine for many years to come, please follow these recommendations:

- Read and understand this *Operation Manual* before you operate the machine to ensure that you follow safe operating practices and maintenance procedures.
- Keep this *Operation Manual* in a convenient place for easy access.
- If this *Operation Manual* is lost or damaged, order a new one from your authorized Yanmar marine dealer or distributor.
- Make sure this manual is transferred to subsequent owners. This manual should be considered a permanent part of the engine and remain with it.
- Constant efforts are made to improve the quality and performance of Yanmar products, so some details included in this *Operation Manual* may differ slightly from your engine. If you have any questions about these differences, please contact your authorized Yanmar marine dealer or distributor.
- The specifications and components (instrument panel, fuel tank, etc.) described in this manual may differ from ones installed on your vessel. Please refer to the manual provided by the manufacturer of these components.
- Refer to the Yanmar Limited Warranty Handbook for a complete warranty description.

RECORD OF OWNERSHIP

Take a few moments to record the information you need when you contact Yanmar for service, parts or literature.

Engine Model: _____

Engine Serial No.: _____

Date Purchased: _____

Dealer: _____

Dealer Phone: _____

SAFETY

Yanmar considers safety of great importance and recommends that anyone that comes into close contact with its products, such as those that install, operate, maintain or service Yanmar products, exercise care, common sense and comply with the safety information in this manual and on the machine's safety labels. Keep the labels from becoming dirty or torn and replace them if they are lost or damaged. Also, if you need to replace a part that has a label attached to it, make sure you order the new part and label at the same time.

This safety alert symbol appears with most safety statements. It means attention, become alert, your safety is involved! Please read and abide by the message that follows the safety alert symbol.

⚠ DANGER

Indicates an hazardous situation which, if not avoided, *will* result in death or serious injury.

⚠ WARNING

Indicates a hazardous situation which, if not avoided, *could* result in death or serious injury.

⚠ CAUTION

Indicates a hazardous situation which, if not avoided, *could* result in minor or moderate injury.

NOTICE

Indicates a situation which can cause damage to the engine, personal property and / or the environment or cause the equipment to operate improperly.

SAFETY PRECAUTIONS

General Information

There is no substitute for common sense and careful practices. Improper practices or carelessness can cause burns, cuts, mutilation, asphyxiation, other bodily injury or death. This information contains general safety precautions and guidelines that must be followed to reduce risk to personal safety. Special safety precautions are listed in specific procedures. Read and understand all of the safety precautions before operation or performing repairs or maintenance.

Before You Operate

⚠ DANGER

The safety message that follows has DANGER level hazards.

NEVER permit anyone to install or operate the engine without proper training.

- Read and understand this *Operation Manual* before you operate or service the engine to ensure that you follow safe operating practices and maintenance procedures.
- Safety signs and labels are additional reminders for safe operating and maintenance techniques.
- See your authorized Yanmar Marine dealer or distributor for additional training.

During Operation and Maintenance

⚠ DANGER

The safety message that follows has DANGER level hazards.

Crush Hazard

NEVER stand under hoisted engine. If the hoist mechanism fails, the engine will fall on you.

⚠ WARNING

The safety messages that follow have WARNING level hazards.

Explosion Hazard

While the engine is running or the battery is charging, hydrogen gas is being produced and can be easily ignited. Keep the area around the battery well-ventilated and keep sparks, open flames and any other form of ignition out of the area.

Fire and Explosion Hazard

Diesel fuel is flammable and explosive under certain conditions.

NEVER use a shop rag to catch the fuel.

Wipe up all spills immediately.

NEVER refuel with the engine running.

NEVER use diesel fuel as a cleaning agent.

Store any containers containing fuel in a well-ventilated area, away from any combustibles or sources of ignition.

Fire Hazard

Undersized wiring systems can cause an electrical fire.

Store any containers containing fuel or other flammable products in a well-ventilated area, away from any combustibles or source of ignition.

Store any equipment in a designated area away from moving parts.

NEVER use the engine compartment for storage.

Sever Hazard

Rotating parts can cause severe injury or death. NEVER wear jewelry, unbuttoned cuffs, ties or loose fitting clothing and ALWAYS tie long hair back when working near moving / rotating parts such as the flywheel or PTO shaft. Keep hands, feet and tools away from all moving parts.

Alcohol and Drug Hazard

NEVER operate the engine while under the influence of alcohol or drugs or feeling ill.

Exposure Hazard

ALWAYS wear personal protective equipment including appropriate clothing, gloves, work shoes, eye and hearing protection as required by the task at hand.

Entanglement Hazard

NEVER leave the key in the key switch when you are servicing the engine. Someone may accidentally start the engine and not realize you are servicing it.

NEVER operate the engine while wearing a headset to listen to music or radio because it will be difficult to hear the warning signals.

⚠ WARNING

Piercing Hazard

Avoid skin contact with high-pressure diesel fuel spray caused by a fuel system leak such as a broken fuel injection line. High-pressure fuel can penetrate your skin and result in serious injury. If you are exposed to high-pressure fuel spray, obtain prompt medical treatment.

NEVER check for a fuel leak with your hands. ALWAYS use a piece of wood or cardboard. Have your authorized Yanmar Marine dealer or distributor repair the damage.

Burn Hazard

Some of the engine surfaces become very hot during operation and shortly after shutdown. Keep hands and other body parts away from hot engine surfaces.

Sudden Movement Hazard

ALWAYS stop the engine before beginning service.

Exhaust Hazard

NEVER block windows, vents or other means of ventilation if the engine is operating in an enclosed area. All internal combustion engines create carbon monoxide gas during operation and special precautions are required to avoid carbon monoxide poisoning.

⚠ CAUTION

The safety messages that follow have CAUTION level hazards.

Poor Lighting Hazard

Ensure that the work area is adequately illuminated. ALWAYS install wire cages on portable safety lamps.

Tool Hazard

ALWAYS use tools appropriate for the task at hand and use the correct size tool for loosening or tightening machine parts.

Flying Object Hazard

ALWAYS wear eye protection when servicing the engine or when using compressed air or high-pressure water. Dust, flying debris, compressed air, pressurized water or steam may injure your eyes.

Coolant Hazard

Wear eye protection and rubber gloves when you handle Long Life engine coolant. If contact with the eyes or skin should occur, flush eyes and wash immediately with clean water.

NOTICE

The safety messages that follow have NOTICE level hazards.

It is important to perform daily checks as listed in the *Operation Manual*. Periodic maintenance prevents unexpected downtime, reduces the number of accidents due to poor engine performance and helps extend the life of the engine.

See your authorized Yanmar Marine dealer or distributor if you need to operate the engine at high altitudes. At high altitudes the engine will lose power, run rough and produce exhaust gases that exceed the design specifications.

ALWAYS be environmentally responsible.

Follow the guidelines of the EPA or other governmental agencies for the proper disposal of hazardous materials such as engine oil, diesel fuel and engine coolant. Consult the local authorities or reclamation facility.

NEVER dispose of hazardous materials by dumping them into a sewer, on the ground or into ground water or waterways.

If a Yanmar Marine engine is installed at an angle that exceeds the specifications stated in the Yanmar Marine installation manuals, engine oil may enter the combustion chamber, causing excessive engine speed, white exhaust smoke and serious engine damage. This applies to engines that run continuously or those that run for short periods of time.

If you have an installation with two or three engines and only one engine is operating, the water pickup (thru-hull) of the non-running engine(s) should be closed. This will prevent water from being forced past the seawater pump and eventually finding its way into the engine. The result of water entering the engine could cause seizure or other serious problems.

If you have an installation with two or three engines, and only one engine is operating, please note that if the propeller shaft thru-hull (stuffing box) is lubricated by engine water pressure and the engines are interconnected, care must be taken that water from the running engine does not enter the exhaust of the non-running engine(s). This water could cause seizure of the non-running engine(s). See your authorized Yanmar Marine dealer or distributor for a complete explanation of this condition.

If you have an installation with two or three engines, and only one engine is operating, it is important to limit the amount of throttle applied to the running engine. If you observe black smoke or movement of the throttle does not increase engine rpm, you are overloading the engine that is running. Immediately throttle back to approximately 2/3 throttle or to a setting where the engine performs normally. Failure to do so may cause the running engine to overheat or cause excess carbon buildup which may shorten the engine's life.

SAFETY DECALS

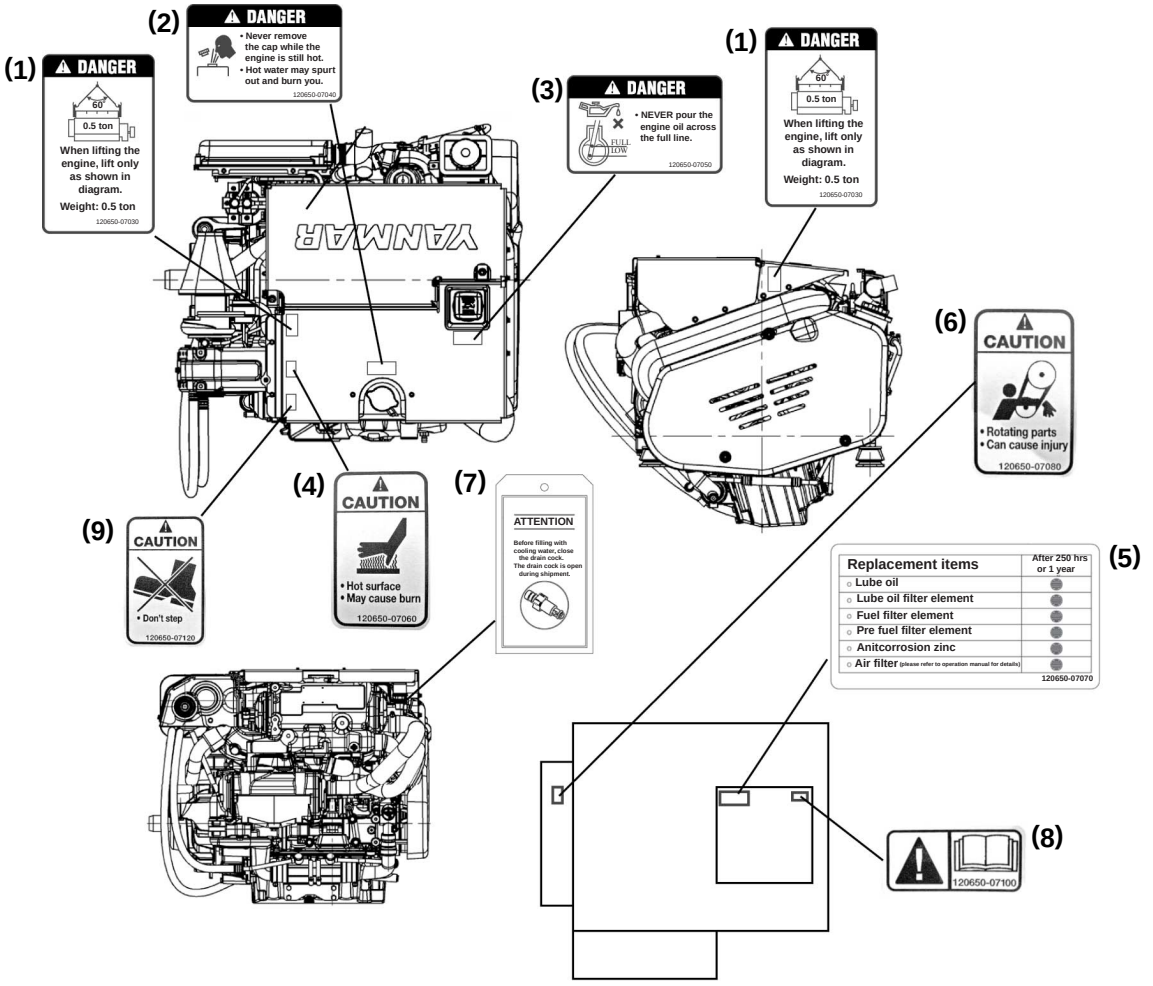

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Figure 1

1 – 120650-07030
2 – 120650-07040
3 – 120650-07050
4 – 120650-07060
5 – 120650-07070
6 – 120650-07080
7 – 120650-07090
8 – 120650-07100
9 – 120650-07121

PRODUCT OVERVIEW

YANMAR BY-SERIES FEATURES AND APPLICATIONS

The BY-series engines are in-line 4- and 6-cylinder direct injection diesel engines. The engines are turbocharged and equipped with a liquid cooling system.

These engines are designed for pleasure craft use.

In order to obtain full performance from your engine, it is imperative that you check the size and structure of the hull and use a propeller of the appropriate size. As new boats are used, owners add additional equipment and completely fill the fuel and water tanks adding to the overall displacement (weight) of the vessel. Extra canvas enclosures, bottom paint, and bottom fouling can add additional hull resistance. It is recommended that a new vessel be propped so the engine can operate at 100 rpm above maximum rpm to allow for some added weight and hull resistance. Failure to do so can lead to reduced vessel performance, increased smoke levels and cause permanent damage to your engine.

The engine must be installed correctly with the seawater or cooling water piping, exhaust gas piping and electrical wiring. Any auxiliary equipment attached to the engine should be easy to use and accessible for service. To handle the drive equipment, propulsion systems (including the propeller) and other on-board equipment, be sure to observe the instructions and cautions given in the operation manuals supplied by the shipyard and equipment manufacturers.

The laws of some countries may require hull and engine inspections, depending on the use, size and cruising area of the boat. The installation, fitting and surveying of this engine all require specialized knowledge and engineering skills. See Yanmar's local subsidiary in your region or your authorized Yanmar marine dealer or distributor.

This engine is designed for pleasure boat applications. The engine is designed to be operated at: maximum throttle for less than 5% of its total operation time (30 minutes out of every 10 hours). The engine should be operated at cruising speed (3200 - 3300 rpm) for less than 90% of its total operation time (9 hours out of every 10 hours).

New Engine Break In

- On the initial engine start-up, check for proper engine oil pressure, diesel fuel leaks, engine oil leaks, coolant leaks, and for proper operation of the indicators and / or gauges.
- During the first 50 hours of operation, operate your new engine under a substantial load at all times. For best break-in results, operate the engine at various speeds.
- During the first 50 hours of operation, try to reduce unnecessary idling in Neutral.
- During the break-in period, carefully observe the engine oil pressure and engine temperature.
- During the break-in period, check the engine oil and coolant levels frequently.

COMPONENT IDENTIFICATION

Figure 1, **Figure 2** and **Figure 3** illustrate a typical version of a 4BY2 engine. Your engine may have different equipment from that illustrated.

Left Side (as viewed from flywheel) - 4BY2

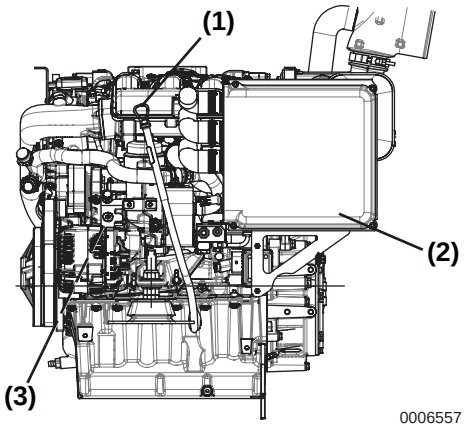

Figure 1

1 – Engine Oil Dipstick
2 – E-Box Panel
3 – High Pressure Fuel Pump

Right Side (as viewed from flywheel) - 4BY2

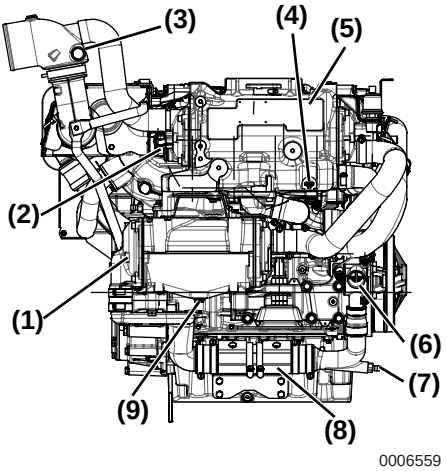

Figure 2

1 – Zinc Anode
2 – Zinc Anode
3 – Exhaust / Water Mixing Elbow
4 – Coolant Drain Cock
5 – Heat Exchanger
6 – Seawater Pump
7 – Seawater Drain Cock
8 – Hydraulic Oil Cooler
9 – Coolant Drain Plug

Top View - 4BY2

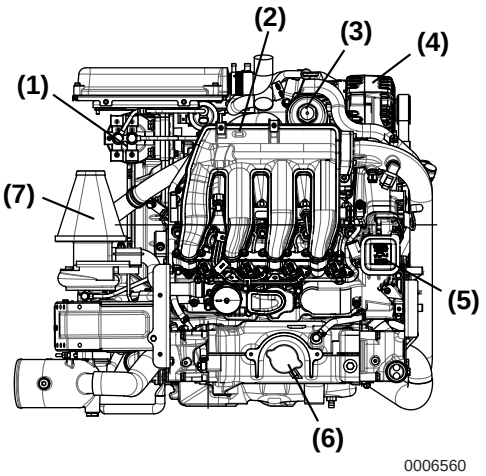

Figure 3

1 – Fuel Fine Filter
2 – Intake Air Manifold
3 – Engine Oil Filter
4 – Power Steering Filler Port (if equipped)
5 – Engine Oil Filler Port
6 – Coolant Filler Port
7 – Air Filter

*Note: Yanmar supplies a water-separating pre-filter for mounting by the installer. The engine is equipped with an on-engine fine filter **(Figure 3, (1))**.*

Figure 4, **Figure 5** and **Figure 6** illustrate a typical version of a 6BY2 engine. Your engine may have different equipment from that illustrated.

Left Side - 6BY2

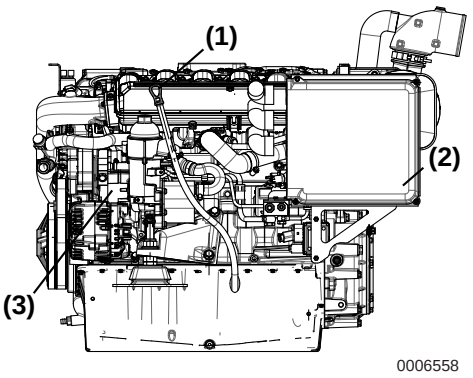

Figure 4

1 – Engine Oil Dipstick
2 – E-Box Panel
3 – High Pressure Fuel Pump

Right Side - 6BY2

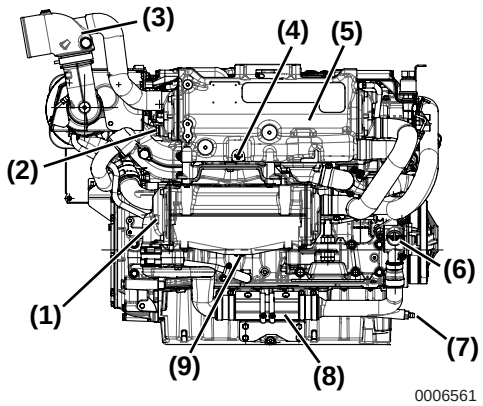

Figure 5

1 – Zinc Anode
2 – Zinc Anode
3 – Exhaust / Water Mixing Elbow
4 – Coolant Drain Cock
5 – Heat Exchanger
6 – Seawater Pump
7 – Seawater Drain Cock
8 – Hydraulic Oil Cooler
9 – Coolant Drain Plug

Top View - 6BY2

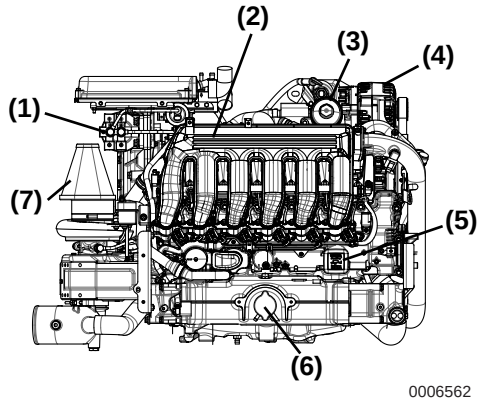

Figure 6

1 – Fuel Fine Filter
2 – Intake Air Manifold
3 – Engine Oil Filter
4 – Power Steering Filler Port (if equipped)
5 – Engine Oil Filler Port
6 – Coolant Filler Port
7 – Air Filter

*Note: Yanmar supplies a water-separating pre-filter for mounting by the installer. The engine is equipped with an on-engine fine filter **(Figure 6, (1))**.*

LOCATION OF NAMEPLATES

The engine data and drive information nameplates on Yanmar BY2 series engines are shown in **Figure 7**, **Figure 8** and **Figure 9**. Replace if damaged or lost.

The typical location of the engine name plate is shown for Yanmar 4BY2 Series marine engines **(Figure 7)** and 6BY2 engines **(Figure 8)**.

4BY2

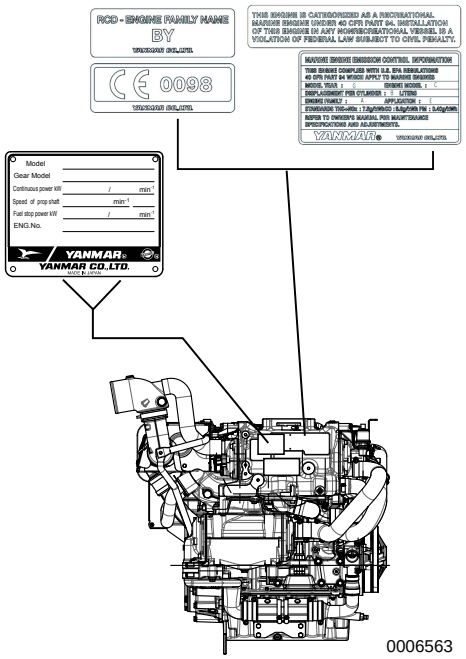

Figure 7

6BY2

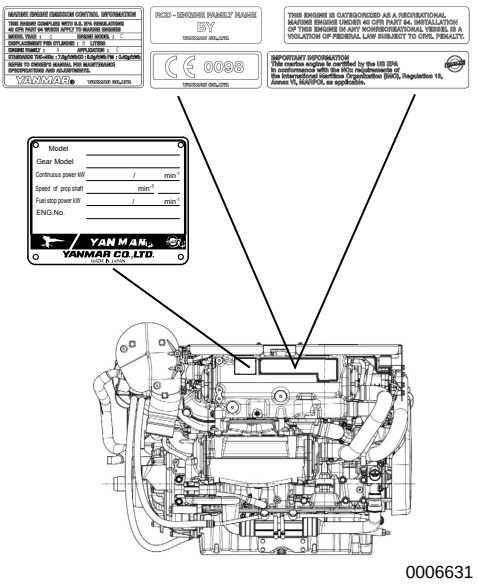

Figure 8

The engine block information is etched into the cylinder block behind the engine oil cooler near the end of the starting motor **(Figure 9)**.

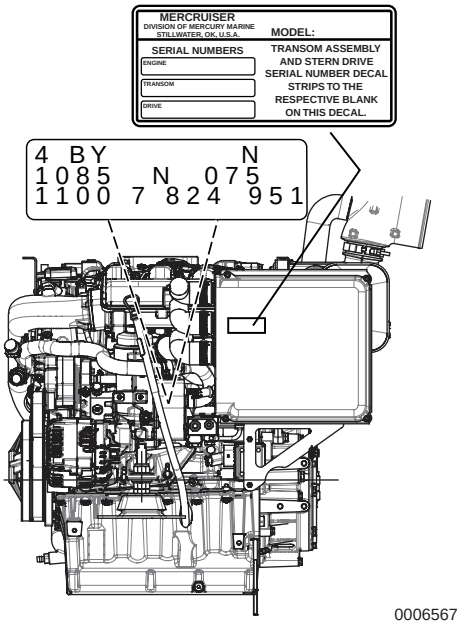

Figure 9

FUNCTION OF MAJOR COMPONENTS

Name of Component	Function
Fuel Filter / Water Separator (not supplied by Yanmar)	Removes dirt and water from the fuel. The filter element should be replaced periodically. *See Replacing Fuel Filter / Water Separator Element on page 52*. The water separator should be drained periodically. *See Draining the Fuel / Water Separator on page 47*.
Fuel Fine Filter	Removes extremely fine contaminants from fuel prior to entering fuel injection system.
Fuel Feed Pump	Pumps fuel from the tank to the fuel injection system.
Engine Oil Fill Port	To add engine oil.
Engine Oil Filter	Filters fine metal fragments and carbon from the engine oil. Filtered engine oil is distributed to the engine's moving parts. The filter is a cartridge type and the element should be replaced periodically. *See Changing the Engine Oil and Replacing the Engine Oil Filter on page 48*.
Coolant System	There are two cooling systems: 1) closed cooling with coolant and 2) seawater. The engine is cooled by the closed cooling system. The closed system coolant is cooled by seawater using a heat exchanger. The seawater also cools the marine gear or power steering oil, and the combustion intake air through cooler(s) in an open circuit.
Closed Cooling Circulation Pump	The centrifugal coolant pump circulates coolant inside the engine. The circulating pump is driven by a poly V-belt.
Seawater Pump	Pumps seawater from outside vessel to the engine. The seawater pump is belt-driven and has a replaceable rubber impeller. Avoid impeller damage, do not operate it without seawater.
Coolant Fill Cap	When the coolant temperature rises, the pressure inside the heat exchanger increases, causing the pressure valve in the filler cap to open, forcing hot water and steam through a rubber hose to the coolant recovery tank. When the engine becomes cool and the pressure inside the coolant recovery tank drops, the vacuum valve in the filler cap opens and the coolant in the coolant recovery tank returns to the heat exchanger through the hose and filler cap. This minimizes coolant consumption.
Coolant Recovery Tank	The coolant fill cap valve releases vapor and hot water overflow to the coolant recovery tank. When the engine stops and the coolant cools, the pressure in the heat exchanger drops. The fill cap valve then opens to send coolant back from the coolant recovery tank. This minimizes coolant consumption. The closed cooling system coolant level can easily be checked and refilled in this tank.
Oil Cooler - Engine	A heat exchanger that cools high temperature engine oil using engine coolant.
Oil Cooler - Hydraulic	A heat exchanger that cools the marine gear oil or power steering fluid using seawater.
Turbocharger	The turbocharger pressurizes the air coming into the engine. It is powered by a turbine that is driven by exhaust gases.
Air Filter	The air filter removes dirt from the intake combustion air reducing engine wear.
Nameplates	Nameplates are provided on the engine and the marine gear and have the model, serial number and other data.

Name of Component	Function
Electrical Panel (E-Box)	The electrical panel houses the engine electrical system fuses, relays, and ECU. The ECU monitors data from the various sensors and controls such functions as low-pressure fuel pump operation, fuel injection pressure, fuel injection system volume, and the timing and volume of fuel injected by the Bosch electronic fuel injectors. Throttle control is fly-by-wire meaning it is controlled by electric signals from the helm. The throttle control is either analog or digital depending on the level of control options installed. The ECU also uses sensor inputs to monitor engine condition and will set a trouble code if a system or sensor indicates a problem. In most cases, a Check Engine light will be displayed. The engine may or may not run normally depending on the fault. Not all inputs are monitored by the ECU. Low oil pressure and water in fuel are two examples. Either of these conditions will result in a warning indicator and possible audible alarm. Low oil pressure will also be indicated by the oil gauge at the helm (not available with Classic Controls).
Electrical Panel (E-Box) Circuit Breaker	The electrical panel circuit breaker is installed in the positive (+) cable of the electrical panel power lead, and provides overload protection for the electrical panel. The electrical panel power leads must be connected directly to the battery, and must have a breaker installed in the B+ (red) lead.

FUSES AND RELAYS

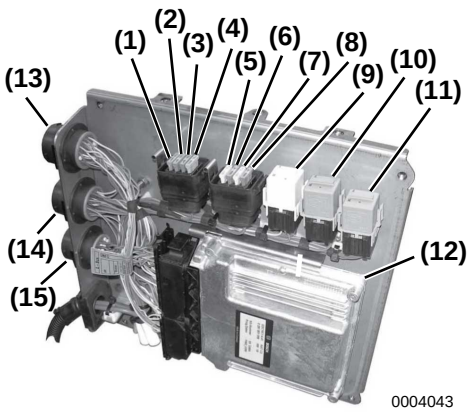

Figure 10

1 – Fuse F1 (3 A) - CAN Switched Power
2 – Fuse F2 (10 A) - Ignition*
3 – Fuse F3 (15 A) - Fuel Supply Pump
4 – Fuse F4 (30 A) - ECU Switched Power
5 – Fuse F5 (20 A) - Power to Sensors and Actuators
6 – Fuse F6 (10 A) - Auxiliary Power
7 – Jumper Fuse F7 (3 A) - Single / Port Selection, default is single / port (fuse in). Remove fuse for starboard configuration.
8 – Jumper Fuse F8 (3 A) - CAN / Analog Throttle Selection, default is analog (fuse out). Insert 3 A fuse to configure for CAN.
9 – K1 - Starter Relay
10–K3 - Fuel Supply Pump Relay
11–K2 - Main Power Relay
12–ECU
13–Connector X1 - Communication to Helm Display
14–Connector X21/1 - Engine Wiring Harness
15–Connector X22/1 - Fuel Injector Wiring Harness

To access the fuse and relay panel, remove the four bolts from the E-Box cover and remove cover.

NOTICE: *The electrical panel cables must be connected directly to the battery, and must have a circuit breaker installed in the B + (red) lead.*

* NEVER connect any additional devices to F2. F6 may be used however, it is not switched.

ENGINE COVER

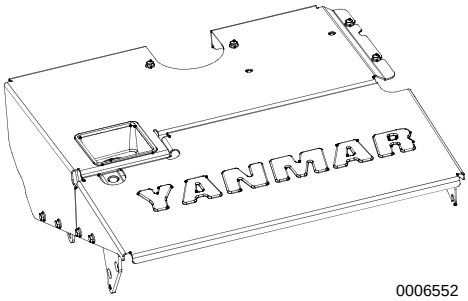

Figure 11

To remove the cover from the engine, remove all bolts, then lift cover from engine.

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BEFORE YOU OPERATE

This section of the *Operation Manual* describes the diesel fuel, engine oil, and engine coolant specifications and how to replenish them. It also describes the daily engine checkout.

DIESEL FUEL

Diesel Fuel Specifications

NOTICE: *Only use diesel fuels recommended by Yanmar for the best engine performance, to prevent engine damage and to comply with EPA warranty requirements. Only use clean diesel fuel.*

Diesel fuel should comply with the following specifications. The table lists several specifications for diesel fuels.

DIESEL FUEL SPECIFICATION	LOCATION
No. 2-D, No. 1-D, ASTM D975-94	USA
EN590:96	European Union

Bio-Diesel Fuels

Yanmar approves the use of bio-diesel fuels that do not exceed a blend of 5% non-mineral oil based fuel with 95% standard diesel fuel. Such bio-diesel fuels are known in the marketplace as B5 bio-diesel fuels. B5 bio-diesel fuel can reduce particulate matter and the emission of “greenhouse” gases compared to standard diesel fuel.

NOTICE: *If the B5 bio-diesel fuel used does not meet the approved specifications, it will cause abnormal wear of injectors, reduce the life of the engine and it may affect the warranty coverage of your engine.*

B5 diesel fuels must meet certain specifications

The bio-diesel fuels must meet the minimum specifications for the country in which they are used:

- In Europe, bio-diesel fuels must comply with the European Standard EN14214.
- In the United States, bio-diesel fuels must comply with the American Standard ASTM D-6751.

Bio-diesel should be purchased only from recognized and authorized diesel fuel suppliers.

Precautions and concerns regarding the use of bio-fuels:

- Bio-diesel fuels have a higher content of methyl-esters, which may deteriorate certain metal, rubber and plastic components of the fuel system. The customer and / or boat builder are responsible to verify the usage of bio-diesel compatible components on the vessel fuel supply and return systems.
- Free water in bio-diesel may result in plugging of fuel filters and increased bacterial growth.
- High viscosity at low temperatures may result in fuel delivery problems, injection pump seizures, and poor injection nozzle spray atomization.
- Bio-diesel may have adverse effects on some elastomers (seal materials) and may result in fuel leakage and dilution of the engine lubricating oil.
- Even bio-diesel fuels that comply with a suitable standard as delivered, will require additional care and attention to maintain the quality of the fuel in the equipment or other fuel tanks. It is important to maintain a supply of clean, fresh fuel. Regular flushing of the fuel system, and / or fuel storage containers, may be necessary.
- The use of bio-diesel fuels that do not comply with the standards as agreed to by the diesel engine manufacturers and the diesel fuel injection equipment manufacturers, or bio-diesel fuels that have degraded as per the precautions and concerns above, may affect the warranty coverage of your engine.

Additional Technical Fuel Requirements

- The fuel cetane number should be equal to 48 or higher.
- The sulfur content must not exceed 0.3% by volume. Less than 0.05% is preferred.
- Water and sediment in the fuel should not exceed 0.05% by volume.
- Ash content not to exceed 0.01% by mass.
- Carbon residue content not to exceed 0.35% by volume. Less than 0.1% is preferred.
- Total aromatics content should not exceed 35% by volume. Less than 30% is preferred.
- PAH (polycyclic aromatic hydrocarbons) content should be below 10% by volume.
- NEVER mix kerosene, used engine oil or residual fuels with the diesel fuel.
- NEVER use Biocide or mix winter and summer fuels.
- Keep the fuel tank and fuel-handling equipment clean at all times.
- Poor-quality fuel can reduce engine performance and / or cause engine damage.
- Fuel additives are not recommended. Some fuel additives may cause poor engine performance. See your authorized Yanmar marine dealer or distributor for more information.
- Lubricity HFRR < 400 micrometer ISO 12156 (HFRR: High Frequency Reciprocating Rig).

Diesel Fuel Lines

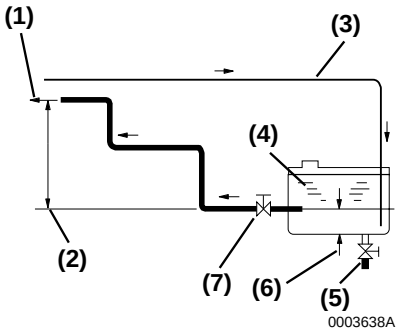

Figure 1

1 – To Fuel Feed Pump
2 – Less Than 500 mm (19.68 in.)
3 – Fuel Return Line
4 – Fuel Tank
5 – Fuel Tank Drain Cock
6 – 20 - 30 mm (0.75 - 1.125 in.)
7 – Fuel Shutoff Valve

Shown is a typical installation of a boat fuel system. Fuel supply **(Figure 1, (2))** and return **(Figure 1, (4))** lines connect to fittings at the engine.

Total suction resistance shall be less than 0.1 bar (40 in.Aq). High resistance may cause poor performance and reduce fuel system life.

Note: Yanmar supplies a water separating pre-filter for mounting by the installer. The engine is also equipped with an on-engine fine filter.

Filling the Fuel Tank

NOTICE: *Operate bilge ventilation (blowers) for a minimum of 5 minutes to purge fumes from engine compartment after refueling. Never operate bilge blower while refueling. Doing so can pump explosive fumes into the engine compartment and result in an explosion.*

To Fill the Fuel Tank:

NOTICE: *Only fill the fuel tank with diesel fuel. Filling the fuel tank with gasoline may result in a fire and will damage the engine.*

1. Clean the area around the fuel cap.
2. Remove the fuel cap from the fuel tank filler port.
3. NOTICE: *Hold the hose nozzle firmly against the filler port while filling. This prevents static electricity buildup which could cause sparks and ignite fuel vapors.* Stop fueling when the gauge shows the fuel tank is full. NOTICE: *NEVER overfill the fuel tank.*
4. Replace the fuel cap and hand-tighten. Over-tightening the fuel cap will damage it.

Bleeding the Fuel System

The fuel system needs to be bled under the following conditions:

- Before starting the engine for the first time.
- After running out of fuel and fuel has been added to the fuel tank.
- After fuel system maintenance, such as changing the fuel filter and draining the fuel filter / water separator, or replacing a fuel system component.

The fuel feed pump is ECU-controlled and will operate for only 10 seconds when the key switch is turned ON while the engine is not running or being started. For this reason, the key switch must be repeatedly turned ON then OFF to sufficiently bleed the fuel system.

1. Turn the key switch on and leave on for 10 seconds. NOTICE: *NEVER hold the key in the START position for longer than 10 seconds or the starter motor will overheat.*
2. Turn key switch OFF for 5 seconds, then turn key switch ON for 10 seconds.
3. Repeat steps 1 and 2 five more times.

Note: The engine may run rough and misfire for a few seconds when first started until any remaining air is purged from the fuel system.

4. Attempt to start the engine. If the engine does not start within a reasonable time, repeat steps 1 and 2 until the engine starts and runs. NOTICE: *NEVER use an engine starting aid such as ether. Engine damage will result.*

ENGINE OIL

Engine Oil Specifications

Use a full-synthetic long-life engine oil that meets or exceeds the following guidelines and classifications:

Service Categories

- API Service Categories SM, SL, SJ, SH/CF and CF
- ACEA Service Categories A3, B3 and B4

Definitions

- API Classification (American Petroleum Institute)
- ACEA Classification (Association des Constructeurs Européens d'Automobilies)

Note:

1. *Be sure the engine oil, engine oil storage containers, and engine oil filling equipment are free of sediment and water.*
2. *Change the engine oil after the first 50 hours of operation and then at every 250 hours thereafter.*
3. *Select the oil viscosity based on the ambient temperature where the engine is being operated. See the SAE Service Grade Viscosity Chart.*
4. *Yanmar does not recommend the use of engine oil "additives."*

Engine Oil Viscosity

Select the appropriate engine oil viscosity based on the ambient temperature shown in the SAE Service Grade Viscosity Chart **(Figure 2)**.

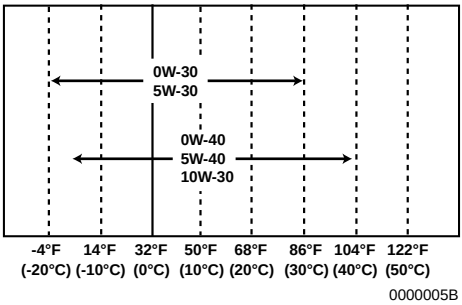

Figure 2

Note: Yanmar recommends using genuine Yanmar Marine Oil specially formulated for the BY engine. Contact your authorized Yanmar dealer or distributor.

Acceptable Engine Oil

LongLife 01 Oils

Trade name	Producer/Supplier
Addinol Super power MV 0537	Addinol Lube Oil GmbH
Agip Formula LL B 01	ENI S.p.A. Refining and Marketing Division
Agip Sint 2000 Evolution	ENI S.p.A. Refining and Marketing Division
Agip TECSINT SL	ENI S.p.A. Refining and Marketing Division
ALPINE Longlife	Mitan Mineralöl GmbH
Aral SuperTronic B	Aral
Aral SuperTronic G	Aral
AXCL S-Class Motor Oil	AXCL Gulf FZE
BMW Quality Longlife 01	BMW
BP Visco 7000	BP Oil International
BP Visco 7000 GM	BP Oil International
BP Visco 7000 Turbo Diesel	BP Oil International
Castrol Edge	Castrol Limited
Castrol Formula RS Power and Protection	Castrol Limited
Castrol Formula SLX	Castrol Limited
Castrol Formula SLX LL01	Castrol Limited
Castrol Formula SLX Long Tex	Castrol Limited
Castrol Formula SLX Turbodiesel	Castrol Limited
Castrol Syntec	Castrol Limited
Castrol Syntec 0W-30 European Formula	Castrol Limited
Castrol Super Racing 0W-40	Castrol Limited
Castrol TXT Softec LL01	Castrol Limited
Cepsa Star Mega Synthetic	Cepsa Lubricantes S.A.
Divinol Syntholight	Zeller+Gmelin
Elf Excellium Full-Tech	Total
Elf Excellium LDX	Total
Elf Excellium XLL	Total
Esso Ultron FE	ExxonMobil
Galp Formula XLD	Petrogal SA
Gulf Formula TLX	Total
Havoline Synthetic BM	Chevron Texaco
Havoline Ultra BM	Chevron Texaco
Igol Process Compact P	Igol France S.A.
INA Futura Compact P	INA Maziva Rijeka
Jet Top Level	ConocoPhillips GmbH
Labo RC	Fuchs Labo Auto S.A.
Liqui Moly Longtime High Tech	Liqui Moly
Megol Motorenöl New Generation	Meguin GmbH
Mobil 1	ExxonMobil
Mobil 1 Turbo Diesel	ExxonMobil

Trade name	Producer/Supplier
Mobil 1 Spezial XS	ExxonMobil
Motorex Profile B-XL	Bucher AG
Motorex Select SP-X	Bucher AG
Motul Specific LL-01	Motul S.A.
OMV full syn plus	OMV AG
Opaljet Longlife	Unil Opal
Panolin Exclusive BD	Panolin AG
Pennzoil European Formula Ultra	Pennzoil-Quaker State
Pentospeed 0W-30 VS*	Deutsche Pentosin-Werke
Petronas Syntium 3000 LL	Petronas
Q8 Formula Special	Kuwait Petroleum
Quaker State European Formula Ultra	Pennzoil-Quaker State
Ravenol HCL	Ravensburger Schmierstoffvertrieb GmbH
Repsol Elite Common Rail	Repsol YPF
Shell Helix Ultra AB	Shell International Petroleum Company
Shell Helix Ultra AL	Shell International Petroleum Company
Statoli LazerWay B	Statoil Lubricants
Tecar Motorenöl Supersyn	Techno-Einkauf GmbH
Titan Supersyn SL	Fuchs Petrolub AG
Titan Supersyn SL Longlife	Fuchs Petrolub AG
Tor Synthetic LL	De Oliebron
Total Activa Expertise 9000	Total
Total Quartz Expertise 9000	Total
Valvoline SynPower MXL	Valvoline
Veedol Powertron LL01	Veedol International
Veedol Syntron	Veedol International
Veritas Syntolube	Ölwerke Julius Schindler GmbH
Wako's Super Synthe	Wako Chemical Co.Ltd
Wintershall VIVA 1 Longlife	SRS Schmierstoff Vertrieb GmbH
Yacco VX 1600	Yacco S.A.S.

LongLife 04 Oils

Trade name	Producer/Supplier
Addinol Super power MV 0537	Addinol Lube Oil GmbH
Agip Formula MS B04	ENI S.p.A.
Aral SuperTronic	Aral
BMW Longlife-04	BMW
Castrol Edge Sport	Castrol Limited
Castrol Edge Turbo Diesel	Castrol Limited
Castrol Formula RS	Castrol Limited
Castrol GTX Magnatec	Castrol Limited
Castrol SLX LL-04	Castrol Limited
Castrol TXT LL-04	Castrol Limited
Elf Excellium LSX	Total
Galp Energy Ultra LS	Petrogal SA
Liqui Moly TopTec 4100	Liqui Moly
Midland ® Synova	Oel-Brack AG
Midland ® Synova	Oel-Brack AG
Mobil 1 ESP Formula	ExxonMobil
Motorenöl Low Emission	Meguin GmbH
Motul 1 Specific LL-04	Motul S.A.
OMV eco plus	OMV AG
Repsol Elite Evolution	Repsol YPF
Shell Helix Ultra AP	Shell International Petroleum Company
Titan GT1	Fuchs Petrolub AG
Wintershall VIVA 1 topsynth alpha LS	SRS Schmierstoff Vertrieb GmbH
York 848	Ginouves SAS

Checking Engine Oil

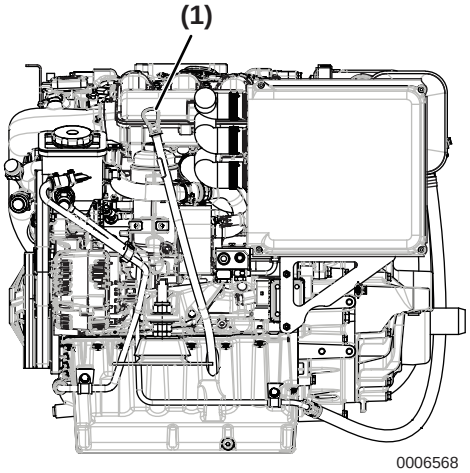

Figure 3

Note: 4BY2 series shown. 6BY2 is similar.

1. NOTICE: *Prevent dirt and debris from contaminating engine oil. Carefully clean the dipstick and the surrounding area before you remove the cap.*Clean area around dipstick.
2. Remove dipstick **(Figure 3, (1))** and wipe with clean cloth.
3. Fully reinsert dipstick.
4. Remove dipstick. The oil level should be between upper **(Figure 4, (1))** and lower lines **(Figure 4, (2))** on the dipstick.

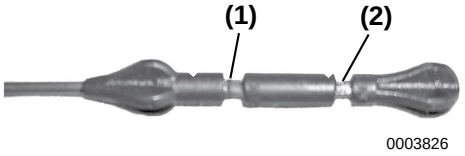

Figure 4

5. Fully reinsert dipstick.

Adding Engine Oil

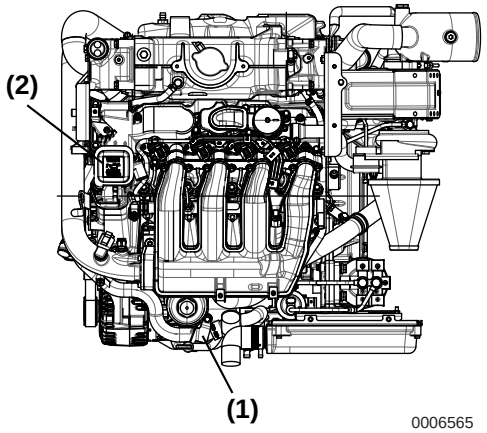

Figure 5

Note: 4BY2 series shown. 6BY2 is similar.

1. Remove the oil filler port cap **(Figure 5, (2))** and pour engine oil into filler port. *See Engine Oil Specifications on page 25*.
2. Fill with oil to the upper limit on the dipstick **(Figure 4, (1))**. NOTICE: *NEVER overfill the engine with engine oil.*
3. Fully insert the dipstick to check the level. NOTICE: *ALWAYS keep the oil level between upper and lower lines on the dipstick.*
4. Tighten the fill port cap securely by hand.

MARINE GEAR OR STERN DRIVE OIL

Refer to the instruction book for each marine gear or stern drive.

POWER STEERING FLUID SPECIFICATIONS

Refer to the stern drive manufacturer's literature for power steering fluid specifications.

Checking Power Steering Fluid Level

1. Remove power steering filler cap.
2. Power steering fluid level must be between the upper **(Figure 6, (1))** and lower **(Figure 6, (2))** level marks.

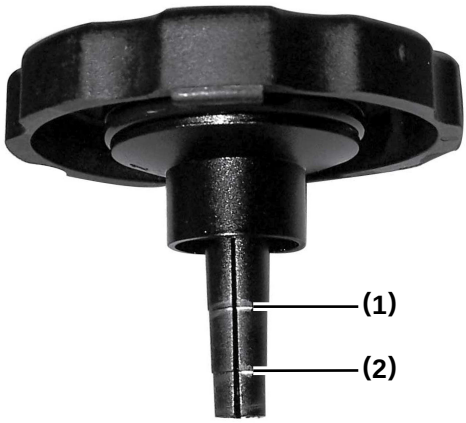

Figure 6

3. Add fluid if necessary.

ENGINE COOLANT

Acceptable Engine Coolant

Trade Name	Manufacturer
Addinol Antifreeze Super	Addinol Lube Oil GmbH
Aral Antifreeze Extra	Aral AG
AVIA Antifreeze APN	AVIA Mineralöl AG
BMW Coolant	BMW AG
BP anti-frost X 2270A	BP Schmierstoff GMBH, Hamburg
Caltex CX Engine Coolant	Caltex
Castrol ANTI-FREEZE NF	Castrol International
Fridex G48	Velena s.a.
Glacelf Plus	Total
GlycoShell	Shell International
Glyco star	Bremin Mineralöl GmbH & Co.
Glysantin G48-24 Engine Coolant	UNICO Ltd.
Glysantin Protect Plus / G48	BASF
GUSOFROST LV 505	Chemische Industrielle Gesellschaft
Mobil Frostchutz 600	Mobil Schmierstoff GmbH
Havoline AFC (BD04)	Chevron Texaco/Arteco
Mobil Frostschutz 600	ExxonMobil
OMV Kühlerfrostschutz	OMV AG
Total Thermofreeze Plus	Total

Note: Yanmar recommends using genuine Yanmar antifreeze / coolant. Contact your authorized Yanmar dealer or distributor.

Adding Engine Coolant

1. Remove the pressure cap and pour coolant mix slowly into the heat exchanger to prevent the formation of air pockets. Fill until the heat exchanger is completely full. NOTICE: *Only use the engine coolant specified. Other engine coolants may affect warranty coverage, cause an internal buildup of rust and scale and / or shorten engine life. Prevent dirt and debris from contaminating engine coolant. Carefully clean the filler cap and the surrounding area before you remove the cap. NEVER mix different types of engine coolants. This may adversely affect the properties of the engine coolant.*
2. Start the engine and allow to idle for approximately 5 minutes.
3. Stop the engine and check the coolant level. Add additional coolant if necessary.
4. Install the pressure cap and tighten firmly. **WARNING!** ***Securely tighten the filler cap after checking the coolant level. Steam can escape during engine operation if the cap is loose.***
5. Remove the coolant recovery tank cap and fill with coolant mix to approximately 50 mm (2 in.) below the full line. Replace cap. Never fill to the full line.
6. After filling an empty cooling system, test-run the engine for about five minutes and check the engine coolant level at the recovery tank again.

ENGINE OPERATION

⚠ WARNING

Fire and Explosion Hazard

Avoid serious personal injury. NEVER jump-start the engine. Sparks caused by shorting the battery to the starter terminals may cause a fire or explosion. ONLY use the key switch to start the engine.

Sudden Movement Hazard

Be sure the boat is in open water away from other boats, docks or other obstructions before increasing rpm. Avoid unexpected equipment movement. Shift the marine gear into the NEUTRAL position any time the engine is at idle.

To prevent accidental equipment movement, NEVER start the engine in gear.

Sever Hazard

Keep children and pets away while the engine is operating.

Exhaust Hazard

Avoid serious injury or death. NEVER block windows, vents or other means of ventilation if the engine is operating in an enclosed area. All internal combustion engines create carbon monoxide gas during operation and special precautions are required to avoid carbon monoxide poisioning.

NOTICE

If any indicator illuminates during engine operation, stop the engine immediately. Determine the cause and repair the problem before you continue to operate the engine.

If the alarm window with audible alarm fails to display and go out about three seconds later when the ignition switch is in the ON position, see your authorized Yamar marine dealer or distributor for service before operating the engine.

Observe the following environmental operating conditions to maintain engine performance and avoid premature engine wear:

- Avoid operating in extremely dusty conditions.
- Avoid operating in the presence of chemical gases or fumes.
- NEVER run the engine if the ambient temperature is above +40°C (+104°F) or below -16°C (+5°F).
- If the ambient temperature exceeds +40°C (+104°F), the engine may overheat and cause the engine oil to break down.
- If the ambient temperature is below -16°C (+5°F), rubber components such as gaskets and seals will harden causing premature engine wear and damage.
- Contact your authorized Yanmar marine engine dealer or distributor if the engine will be operated outside of this standard temperature range.

NEVER engage the starter motor while the engine is running. Damage to the starter motor pinion and / or ring gear will result.

STARTING THE ENGINE

NOTICE: *If the vessel is equipped with a water lift (water lock) muffler, excessive cranking could cause sea water to enter the cylinders and damage the engine. If the engine does not start after cranking for 10 seconds, close the thru-hull water intake valve to avoid filling the muffler with water. Crank for 10 seconds or until the engine starts. When the engines does start, stop the engine immediately and press the switch to the OFF position.*

1. Open the seacock (if equipped).
2. Open the fuel cock.
3. Turn the battery master switch (if equipped) ON.
4. Put remote control handle in NEUTRAL.
5. Ensure lanyard is connected to emergency stop switch.
6. Attach lanyard to clothing.
7. Turn key switch to ON. Ensure that the instrument panel indicators are powered and working. **CAUTION! *NEVER hold the key in the START position for longer than 10 seconds or the starter motor will overheat.***
8. Turn key switch to START. Release the key switch when the engine has started.

Note: Once the engine has started, the ECU will raise the engine speed to 1080 rpm to start alternator charging, and then reduce to low idle rpm.

Starting at Low Temperatures

NOTICE: *NEVER use an engine starting aid such as ether. Engine damage will result.* Comply with local environmental requirements. Use optional glow plugs (if equipped) to avoid starting problems and white smoke.

To limit white smoke, run the engine at low speed and under moderate load until the engine reaches normal operating temperature. A light load on a cold engine provides better combustion and faster engine warm-up than no load.

Avoid running the engine at idling speed any longer than necessary.

SHUTTING DOWN THE ENGINE

Under normal operating conditions, shut down the engine by turning the key switch to OFF.

There will be a delay of up to 3 seconds after turning the key to OFF. This is normal and allows the ECU computer to store data. Wait at least 10 seconds after the engine stops before turning the battery master switch to OFF.

Emergency Shut Down

NOTICE: *NEVER use the emergency stop switch for a normal engine shut-down. Use this switch only when stopping the engine suddenly in an emergency.*

1. Ensure lanyard is connected to the emergency stop switch.
2. Attach the lanyard to a secure place on the operator's clothing or life vest - not where it might tear away.
   NOTICE: *Do not cut or re-tie the lanyard. If it is too long, shorten it by knotting or looping it. Test the emergency engine shut off switch before each outing.*
3. Disconnecting the clip from the stop switch will stop the engine.

NOTICE: *Be sure to close the seacock. Neglecting to close the seacock could allow water to leak into the boat and may cause it to sink.*

CHECKING THE ENGINE AFTER OPERATION

- Check that the key switch is in the OFF position and battery master switch (if equipped) is OFF.
- Fill the fuel tank. Make sure that the fill cap and the area around the fill opening are clean to avoid contamination of the fuel.
- Close seawater cock(s).
- If there is a risk of freezing, check that the cooling system contains enough coolant. *See Engine Coolant on page 31*.
- If there is a risk of freezing, drain the seawater system. *See Draining the Seawater Cooling System on page 70*.

PERIODIC MAINTENANCE

SAFETY PRECAUTIONS

⚠ WARNING

Crush Hazard

If you need to transport an engine for repair, have a helper assist you attach it to a hoist and load it on a truck.

Avoid personal injury or equipment damage. The engine lifting eyes are engineered to lift the weight of the marine engine only. ALWAYS use the engine lifting eyes when lifting the engine.

Avoid serious personal injury. Additional equipment is necessary to lift the marine engine and marine gear together. ALWAYS use lifting equipment with sufficient capacity to lift the marine engine.

Welding Hazard

Make welding repairs safely.

- ALWAYS turn off the battery switch (if equipped) or disconnect the negative battery cable and the leads to the alternator when welding on the equipment.
- Remove the multi-pin connector to the engine control unit. Connect the weld clamp to the component to be welded and as close as possible to the welding point.
- NEVER connect the weld clamp to the engine or in a manner which would allow current to pass through a mounting bracket.
- When welding is completed, reconnect the leads to the alternator and engine control unit prior to reconnecting the batteries.

Exhaust Hazard

Avoid serious injury or death. ALWAYS ensure that all connections are tightened to specifications after repair is made to the exhaust system. All internal combustion engines create carbon monoxide gas during operation and special precautions are required to avoid carbon monoxide poisioning.

⚠ WARNING

Shock Hazard

Avoid serious personal injury or equipment damage. ALWAYS turn off the battery switch (if equipped) or disconnect the negative battery cable before servicing the equipment.

Avoid personal injury or equipment damage. ALWAYS keep the electrical connectors and terminals clean. Check the electrical harnesses for cracks, abrasions, and damaged or corroded connectors.

NOTICE

Any part which is found defective as a result of inspection, or any part whose measured value does not satisfy the standard or limit, must be replaced.

Modifications may impair the engine's safety and performance characteristics and shorten the engine's life. Any alterations to this engine may void its warranty. Be sure to use Yanmar genuine replacement parts.

PRECAUTIONS

The Importance of Periodic Maintenance

Engine deterioration and wear occur in proportion to the length of time the engine has been in service and the conditions the engine is subjected to during operation. Periodic maintenance prevents unexpected downtime, reduces the number of accidents due to poor machine performance and helps extend the life of the engine.

Performing Periodic Maintenance

WARNING! ***NEVER block windows, vents, or other means of ventilation if the engine is operating in an enclosed area. All internal combustion engines create carbon monoxide gas during operation. Accumulation of this gas within an enclosure could cause illness or even death. Make sure that all connections are tightened to specifications after repair is made to the exhaust system. Failure to comply could result in death or serious injury.***

The Importance of Daily Checks

Periodic Maintenance Schedules assume that the daily checks are performed on a regular basis. Make it a habit of performing daily checks before the start of each operating day. *See Daily Checks on page 46*.

Keep a Log of Engine Hours and Daily Checks

Keep a log of the number of hours the engine is run each day and a log of the daily checks performed. Also note the date, type of repair (e.g., replaced alternator), and parts used for any service needed between the periodic maintenance intervals. Periodic maintenance intervals are every 50, 250, 500, 1000 and 2000 engine hours. Failure to perform periodic maintenance will shorten the life of the engine.

Yanmar Replacement Parts

Yanmar recommends that you use genuine Yanmar parts when replacement parts are needed. Genuine replacement parts help ensure long engine life.

Tools Required

Before you start any periodic maintenance procedure, make sure you have the tools you need to perform all of the required tasks.

Ask Your Authorized Yanmar Marine Dealer or Distributor For Help

Our professional service technicians have the expertise and skills to help you with any maintenance or service related procedures.

Required EPA Maintenance

To maintain optimum engine performance and compliance with the Environmental Protection Agency (EPA) Regulations Engines, it is essential that you follow the *Periodic Maintenance Schedule on page 42* and *Periodic Maintenance Procedures on page 48*.

EPA REQUIREMENTS

The EPA emission regulation is applicable only in USA.

Conditions to Ensure Compliance with EPA Emission Standards

This product is an EPA-approved engine.

The following are the conditions that must be met in order to ensure that the emissions during operation meet the EPA standards:

- Ambient temperature: -16° to +40°C (3° to 104°F)
- Relative humidity: 80% or lower

The fuel and lubricating oil used should be as follows:

- Diesel fuel: ASTM D975 No. 1–D or No. 2–D, or equivalent (minimum cetane No. 45)
- Lubricating oil: Type API, Class SM, SL, SJ, SH/CF and CF

Be sure to perform inspections as outlined in *Periodic Maintenance Procedures on page 48* and keep a record of the results.

Pay particular attention to these important points:

- Replacing the engine oil
- Replacing the lube oil filter
- Replacing the fuel filter
- Cleaning the air filter

Note: Inspections are divided into two sections in accordance with who is responsible for performing the inspection: the user or the maker.

Inspection and Maintenance

See Inspection and Maintenance of EPA Emission-Related Parts on page 46. Inspection and maintenance procedures not shown in the *Inspection and Maintenance of EPA Emission-Related Parts on page 46* are covered in *Periodic Maintenance Schedule on page 42*.

This maintenance must be performed to keep the emission values of your engine in the standard values during the warranty period. The warranty period is determined by the age of the engine or the number of hours of operation. *See Yanmar Co., Ltd. Limited Emission Control System Warranty - USA Only on page 75*.

Tightening Fasteners

Use the correct amount of torque when you tighten fasteners on the machine. Applying excessive torque may damage the fastener or component and not enough torque may cause a leak or component failure.

Standard Torque Values

Hexagon Bolts and Nuts

Nominal Diameter	Grade (Lubricated)		
	8.8 or 8	**10.9 or 10**	**12.9 or 12**
M4	2.7 N·m (24 in.-lb)	3.88 N·m (34.3 in.-lb)	4.6 N·m (41 in.-lb)
M5	5.5 N·m (48.6 in.-lb)	8 N·m (71 in.-lb)	9.5 N·m (84 in.-lb)
M6	9.5 N·m (84 in.-lb)	13 N·m (115 in.-lb)	16 N·m (142 in.-lb)
M7	15 N·m (133 in.-lb)	22 N·m (195 in.-lb)	26 N·m (230 in.-lb)
M8	23 N·m (204 in.-lb)	32 N·m (24 ft-lb)	39 N·m (29 ft-lb)
M8 x 1	25 N·m (221 in.-lb)	35 N·m (26 ft-lb)	42 N·m (31 ft-lb)
M10	46 N·m (34 ft-lb)	64 N·m (47 ft-lb)	77 N·m (57 ft-lb)
M10 x 1.25	49 N·m (36 ft-lb)	68 N·m (50 ft-lb)	82 N·m (60 ft-lb)
M12	80 N·m (59 ft-lb)	110 N·m (81 ft-lb)	135 N·m (100 ft-lb)
M12 x 1.5	88 N·m (65 ft-lb)	125 N·m (92 ft-lb)	150 N·m (111 ft-lb)

Hose Clamps

Note: Reuse and retightening is prohibited for all hose clamps. Always install new hose clamps.

Size	Specification
5mm Hex Head	1.0 - 1.5 N·m (8.9 - 13 in.-lb)
6mm Hex Head	2.5 - 3.5 N·m (22 - 31 in.-lb)

PERIODIC MAINTENANCE SCHEDULE

Daily and periodic maintenance is important to keep the engine in good operating condition. The following is a summary of maintenance items by periodic maintenance intervals. Periodic maintenance intervals vary depending on engine application, loads, diesel fuel and engine oil used and are hard to establish definitively. The following should be treated only as a general guideline.

CAUTION! ***Establish a periodic maintenance plan according to the engine application and make sure you perform the required periodic maintenance at intervals indicated. Failure to follow these guidelines will impair the engine's safety and performance characteristics, shorten the engine's life and may affect the warranty coverage on your engine. See your authorized Yanmar marine dealer or distributor for assistance when checking items marked with a ●.***

○: Check or Clean ◇: Replace ●: Contact your authorized Yanmar marine dealer or distributor							
System	**Item**	**Periodic Maintenance Interval**					
		Daily *See Daily Checks on page 46*	**Every 50 hours or monthly whichever comes first**	**Every 250 hours or one year whichever comes first**	**Every 500 hours or 2 years whichever comes first**	**Every 1000 hours or 4 years whichever comes first**	**Every 2000 hours or 8 years whichever comes first**
Whole	Visual inspection of engine exterior	○ Before starting					
Fuel System	Check for fuel leakage	○ Before starting					
	Check the fuel level and refill if necessary	○ Before starting					
	Drain water and sediment from fuel tank			○			
	Drain the fuel filter / water separator If necessary	○					
	Replace the fuel fine filter			◇			
	Replace fuel filter / water separator element			◇			
	Check the fuel pump and fuel lines				●		
Lubricating System	Check the engine oil level and refill if necessary	○ Before starting					
	Change the engine oil and replace the oil filter element		◇ Initial 50	◇			
Cooling System - Engine Coolant	Visual inspection of cooling system	○ Before starting					
	Check coolant level and check for leaks	○ Before starting					
	Replace coolant	When Long Life Coolant (LLC) is used, replace every two years.					

○: Check or Clean ◇: Replace ●: Contact your authorized Yanmar marine dealer or distributor							
System	**Item**	**Periodic Maintenance Interval**					
		Daily *See Daily Checks on page 46*	**Every 50 hours or monthly which-ever comes first**	**Every 250 hours or one year which-ever comes first**	**Every 500 hours or 2 years which-ever comes first**	**Every 1000 hours or 4 years which-ever comes first**	**Every 2000 hours or 8 years which-ever comes first**
Cooling System - Seawater Circuit	Visual inspection of cooling system	○ Before starting					
	Check the seawater outlet	○ Before starting					
	Check seawater pump belt for wear, replace if necessary			◇			
	Check seawater filter (if equipped) and inlet		○				
	Replace the anodes*			◇			
	Check or replace the sea-water pump impeller			●			●
Air Intake and Exhaust System	Visual inspec-tion	○ Before starting					
	Replace turbo-charger heat shield			◇			
	Check the exhaust pipe	○					
	Check the air intake system		○				
	Check the exhaust / water mixing elbow			●			
	Replace the air filter element			●			

○: Check or Clean ◇: Replace ●: Contact your authorized Yanmar marine dealer or distributor

System	Item	Periodic Maintenance Interval					
		Daily *See Daily Checks on page 46*	**Every 50 hours or monthly whichever comes first**	**Every 250 hours or one year whichever comes first**	**Every 500 hours or 2 years whichever comes first**	**Every 1000 hours or 4 years whichever comes first**	**Every 2000 hours or 8 years whichever comes first**
Electrical System	Check the electrolyte level in the battery (serviceable batteries only)		●				
	Check the wiring connectors	○ Before starting					
	Check alternator belt for wear, replace if necessary			○			●
Miscellaneous Items	Check the alarm and indicators (if equipped)	○					
	Check or change power steering fluid	●		●			
	Check for water or oil leakage	○ Before starting					
	Check shift cable adjustment		● Initial 50	●			
	Adjust the propeller shaft alignment (if equipped with marine gear)		● Initial 50	●			
	Check hydraulic oil cooler			●			
	Check and replace rubberized hoses (fuel and water)			●			
	Check flexible engine mounts			○		●	

* Check anodes periodically. Any anode having less than half its original size remaining should be replaced - use this to establish a regular replacement interval.

Note: These procedures are considered normal maintenance and are performed at the owner's expense.

Inspection and Maintenance of EPA Emission-Related Parts

Parts	Interval
Check fuel injection nozzle (cleaning)	1500 hours
Check fuel injection nozzle (adjustment)	3000 hours
Check fuel injection pump (adjustment)	
Check turbocharger (adjustment)	
Check electronic engine control unit (ECU) and its associated sensors and actuators	

Note: The inspection and maintenance items shown above are to be performed at your Yanmar dealer or distributor.

DAILY CHECKS

Before heading out for the day, make sure the Yanmar engine is in good operating condition. **CAUTION!** ***It is important to perform daily checks as listed in this Operation Manual.Periodic maintenance prevents unexpected downtime, reduces the number of accidents due to poor engine performance and helps extend the life of the engine.*** Make sure you check the following items:

Visual Checks

- Check the exterior of the engine for leaks, wear or damage.
- Check for engine oil leaks.
- Check for fuel leaks.
- Check for engine coolant leaks.
- Check for damaged or missing parts.
- Check for loose, missing, or damaged fasteners.
- Check the seawater inlet and outlet for blockage or damage.
- Check the electrical harnesses for cracks, abrasions, and damaged or corroded connectors.
- Check hoses for cracks, abrasions, and damaged, loose or corroded clamps.

CAUTION! ***If any problem is noted during the visual check, the necessary corrective action should be taken before you operate the engine.***

Checking Diesel Fuel, Engine Oil and Engine Coolant Levels

Follow the procedures in *Filling the Fuel Tank on page 24* and *Checking Engine Oil on page 29* to check these levels.

Checking the Battery Electrolyte Level

Check the battery electrolyte level before use. *See Checking the Battery Electrolyte Level (Serviceable Batteries Only) on page 49*.

Checking the Alarm Indicators

Check the instruments and alarm indicators at regular intervals.

Preparing Fuel, Oil and Coolant in Reserve

Prepare sufficient fuel for the day's operation. Always store engine oil and coolant in reserve (for at least one refill) on board, to be ready for emergencies.

Checking Power Steering Fluid

See Checking Power Steering Fluid Level on page 30.

Draining the Fuel / Water Separator

Check the fuel filter / water separator for presence of water and contaminants. If you find any water or contaminants, drain the fuel filter / water separator. If you have to drain the fuel filter / water separator frequently, drain the fuel tank and check for water in your fuel supply. *See Draining the Fuel Tank on page 51*.

1. Turn engine OFF.
2. Ensure the fuel cock is closed.
3. Loosen the drain plug at the bottom of the fuel filter / water separator and drain off any water or sediment.
4. Dispose of waste properly.
5. Tighten the drain plug and open the fuel cock.

PERIODIC MAINTENANCE PROCEDURES

After Initial 50 Hours of Operation

Perform the following maintenance procedures after the initial 50 hours of operation.

- **Changing the Engine Oil and Replacing the Engine Oil Filter**
- **Checking Shift Cable Adjustment**
- **Adjusting the Propeller Shaft Alignment (If Equipped with Marine Gear)**

Changing the Engine Oil and Replacing the Engine Oil Filter

The engine oil on a new engine becomes contaminated from the initial break-in of internal parts. It is very important that the initial oil replacement is performed as scheduled.

It is easiest and most effective to drain the engine oil after operation while the engine is still warm. **WARNING!** ***If you must drain the engine oil while it is still hot, stay clear of the hot engine oil to avoid being burned. ALWAYS wear eye protection.***

1. Turn engine OFF.
2. Remove engine cover.
3. NOTICE: *Prevent dirt and debris from contaminating engine oil. Carefully clean the dipstick and the surrounding area before you remove the cap.*Loosen the engine oil filter cap **(Figure 1, (2))** 1 - 2 turns with a socket wrench. Allow to sit a few minutes to allow oil to drain into crankcase.

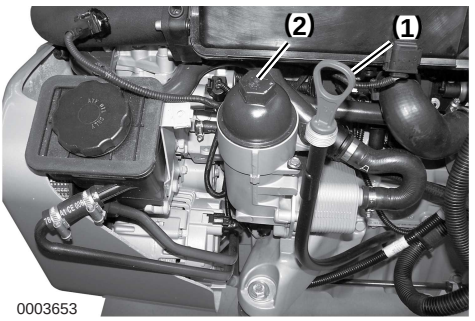

Figure 1

4. Remove the engine oil dipstick **(Figure 1, (1))**. Attach an oil drain pump and pump out the oil. Dispose of waste properly.
5. Remove the engine oil filter cap and filter assembly.
6. Remove the filter element from stem.
7. Replace the three O-rings **(Figure 2, (1))** on the stem.

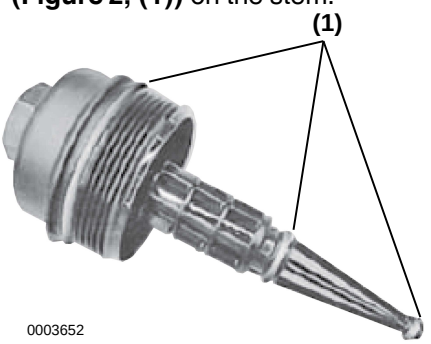

Figure 2

8. Install a new filter element. Ensure the filter fits snugly in the filter cap.
9. Install the cap and filter assembly. Tighten cap by hand until the seal touches the housing.
10. Tighten to 25 N·m (225 in.-lb).
11. Fill with new engine oil. *See Adding Engine Oil on page 29*.
    NOTICE: *NEVER mix different types of engine oil. This may adversely affect the lubricating properties of the engine oil. NEVER overfill. Overfilling may result in white exhaust smoke, engine overspeed or internal damage.*
12. Perform a trial run and check for oil leaks.
13. Approximately 10 minutes after stopping the engine, remove the oil dipstick and check the oil level. Add oil if the level is too low.

Checking Shift Cable Adjustment

See your authorized Yanmar dealer or distributor.

Adjusting Propeller Shaft Alignment (If Equipped with Marine Gear)

The flexible engine mounts are slightly compressed during initial engine operation and may cause misalignment between the engine and the propeller shaft.

This adjustment requires specialized knowledge and techniques. See your authorized Yanmar dealer or distributor.

Every 50 Hours of Operation

After you complete the initial 50 hour maintenance procedures, perform the following procedures every 50 hours or monthly, whichever comes first.

- **Checking Seawater Filter (If Equipped) and Inlet**
- **Checking the Air Intake System**
- **Checking Battery Electrolyte Level (Serviceable Batteries Only)**

Checking the Seawater Filter (If Equipped) and Inlet

Refer to boat builder's literature for information on the seawater filter.

Checking the Air Intake System

Check the air intake system for damage or wear. If necessary, consult your authorized Yanmar dealer or distributor for repair.

Checking the Battery Electrolyte Level (Serviceable Batteries Only)

WARNING! ***Batteries contain sulfuric acid. NEVER allow battery fluid to come in contact with clothing, skin or eyes. Severe burns could result. ALWAYS wear safety goggles and protective clothing when servicing the battery. If battery fluid contacts the eyes and / or skin, immediately flush the affected area with a large amount of clean water and obtain prompt medical treatment.***

NOTICE: *NEVER turn off the battery switch (if equipped) or short the battery cables during operation. Damage to the electric system will result.*

1. Turn the battery master switch OFF (if equipped) or disconnect the negative (-) battery cable.
2. Do not operate with insufficient battery electrolyte as the battery will be destroyed.

3. NOTICE: *NEVER attempt to remove the covers or fill a maintenance-free battery.* Remove the caps and check the electrolyte level in all cells.
4. If the level is lower than the minimum fill level **(Figure 3, (1))**, fill with distilled water **(Figure 3, (2))** (available locally) up to the upper limit **(Figure 3, (3))** of the battery.

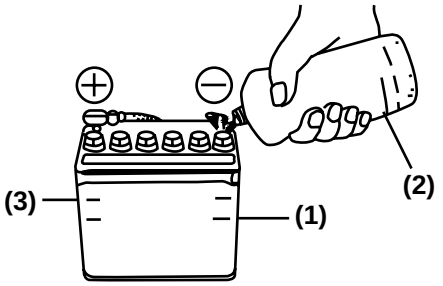

Figure 3

Note: The maximum fill level is approximately 10 - 15 mm (3/8 - 9/16 in.) above the plates. Battery fluid tends to evaporate in high temperatures, especially in summer. In such conditions, inspect the battery more often.

Every 250 Hours of Operation

Perform the following maintenance every 250 hours of operation or yearly, whichever comes first.

- **Draining the Fuel Tank**
- **Replacing the Fuel Fine Filter**
- **Replacing the Fuel Filter / Water Separator Element**
- **Changing the Engine Oil and Replacing the Engine Oil Filter Element**
- **Checking or Replacing the Seawater Pump Belt**
- **Replacing the Anodes**
- **Checking or Replacing the Seawater Pump Impeller**
- **Replacing the Turbocharger Heat Shield**
- **Checking the Exhaust / Water Mixing Elbow**
- **Replacing the Air Filter Element**
- **Cleaning the Turbocharger Blower**
- **Checking or Replacing the Alternator Belt**
- **Changing the Power Steering Fluid**
- **Checking the Shift Cable Adjustment**
- **Adjusting the Propeller Shaft Alignment**
- **Checking the Hydraulic Oil Cooler**
- **Checking or Replacing Rubber Hoses**
- **Checking Flexible Engine Mounts**

Draining the Fuel Tank

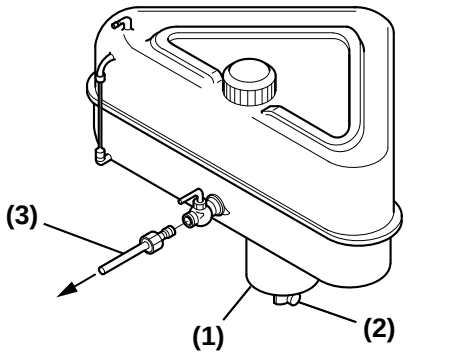

Figure 4

1 – Sediment Bowl
2 – Drain Cock
3 – Fuel Line to Engine

Note: Typical fuel tank shown. Actual equipment may differ.

1. Turn engine OFF.
2. Put a container under the drain cock **(Figure 4, (2))** to catch fuel.
3. Open the drain cock and drain water and sediment. Close the drain cock when the fuel is clean.
4. Dispose of waste properly.

Replacing the Fuel Fine Filter

1. Disconnect the battery negative (-) cable.
2. Close the fuel tank cock.

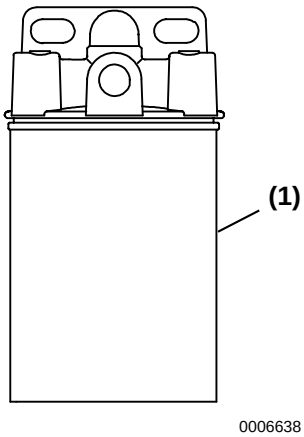

Figure 5

3. Unscrew and remove filter cartridge **(Figure 5, (1))**.
4. Replace rubber seal.
5. Replace filter. NOTICE: *When replacing fuel filters, always pre-fill them with fresh, clean fuel to improve the system's ability to be bled.*
6. Hand-tighten cartridge to filter.
7. Connect battery negative (-) cable.
8. Bleed the fuel system and check for leaks. *See Bleeding the Fuel System on page 24*.

Replacing Fuel Filter / Water Separator Element

Note: Yanmar supplies a water separating pre-filter separate from the engine. Location and type of filter may vary.

1. Disconnect the battery negative (-) cable.
2. Close the fuel tank cock.
3. Loosen the drain plug **(Figure 6, (4))** on the bottom of the fuel filter / water separator and drain off any water or sediment.
4. Disconnect water sensor connector **(Figure 6, (1))**.
5. Turn the filter bowl **(Figure 6, (5))** counterclockwise to remove.
6. Remove the old filter element.
7. Clean the filter bowl. Inspect the water sensor probe **(Figure 6, (1))** for damage if equipped. Inspect the bowl seal **(Figure 6, (2))**.
   NOTICE: *When replacing fuel filters, always pre-fill them with fresh, clean fuel to improve the system's ability to be bled.*

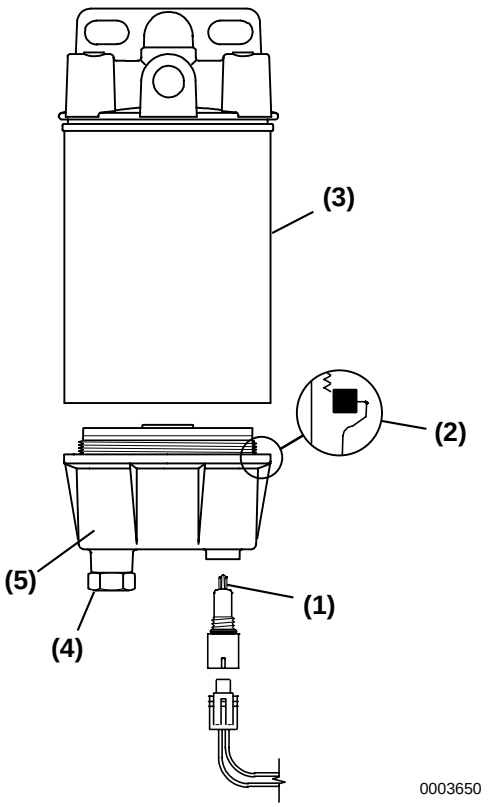

Figure 6

8. Lubricate the seal at the top of the new filter element **(Figure 6, (3))** and install .
9. Lubricate the filter bowl seal **(Figure 6, (2))** and install the filter bowl **(Figure 6, (5))**. Turn clockwise by hand to tighten.
10. Ensure drain plug **(Figure 6, (4))** is securely tightened.
11. Connect water sensor connector **(Figure 6, (1))** if equipped.
12. Open the fuel cock.
13. Connect the battery negative (-) cable.

14. Bleed air from the fuel system and check for leaks. *See Bleeding the Fuel System on page 24*.

Changing the Engine Oil and Replacing Engine Oil Filter Element

To change engine oil and replace the engine oil filter element, see *Changing the Engine Oil and Replacing the Engine Oil Filter on page 48*.

Checking or Replacing the Seawater Pump and Alternator Belts

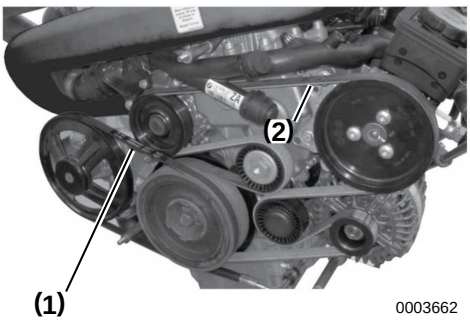

Figure 7

NOTICE: *NEVER get any oil on the belt(s). Oil on the belt causes slipping and stretching. Replace the belt if it is damaged.*

1. Disconnect battery negative (-) cable from the battery.
2. Remove belt guard.
3. Check the seawater pump belt **(Figure 7, (1))** and alternator belt **(Figure 7, (2))** for wear, cracks or damage.
4. Replace if necessary. See your authorized Yanmar dealer or distributor.
5. Install belt guard and connect battery negative (-) cable.

Replacing the Zinc Anodes

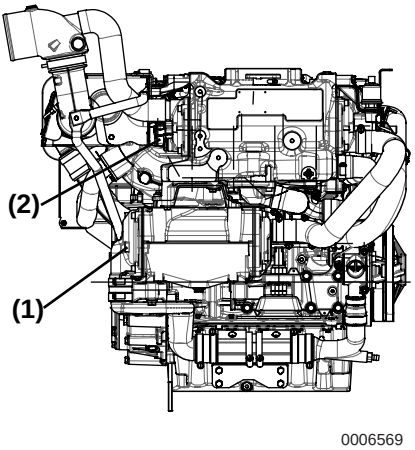

Figure 8

There are zinc anodes in the seawater cooling system and they should be inspected and replaced periodically.

Zinc anodes are located in the heat exchanger **(Figure 8, (1))** and the charge air cooler **(Figure 8, (2))**. An additional zinc anode may also be located in the exhaust / water mixing elbow.

1. Disconnect battery negative (-) cable.
2. Remove each anode and inspect for corrosion. Any anode having less than half its original size remaining should be replaced.
   NOTICE: *NEVER use thread sealer or thread sealing tape when installing zinc anodes. Anodes must make good metal-to-metal contact to perform properly.*
3. Install each anode using a new copper gasket and tighten to 25 N·m (18 ft-lb).
4. Start engine and check for water leaks.

Checking or Replacing the Seawater Pump Impeller

See your authorized Yanmar dealer or distributor.

Replacing the Turbocharger Heat Shield

See your authorized Yanmar dealer or distributor.

Checking Exhaust / Water Mixing Elbow

See your authorized Yanmar dealer or distributor.

Replacing Air Filter Element

1. Turn engine OFF.
2. Remove engine cover.
3. Remove clamp **(Figure 9, (1))**.

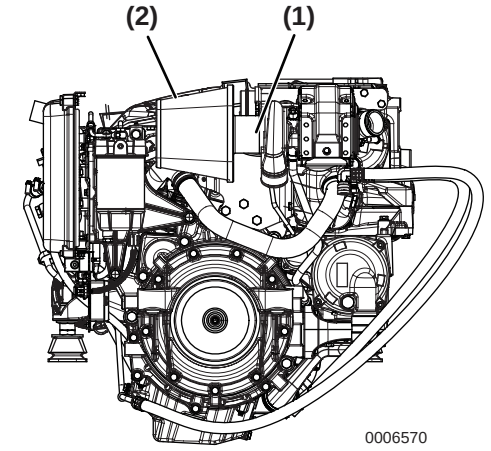

Figure 9

4. Remove air filter **(Figure 9, (2))**.
5. Replace air filter.

Cleaning the Turbocharger Blower

See your authorized Yanmar dealer or distributor.

Checking or Replacing Alternator Belt

See Checking or Replacing the Seawater Pump and Alternator Belts on page 53.

Changing Power Steering Fluid

See your authorized Yanmar dealer or distributor.

Checking Shift Cable Adjustment

See Checking Shift Cable Adjustment on page 49.

Adjusting the Propeller Shaft Alignment

See Adjusting Propeller Shaft Alignment (If Equipped with Marine Gear) on page 49.

Checking Hydraulic Oil Cooler

See your authorized Yanmar dealer or distributor.

Checking or Replacing Rubber Hoses

Check rubber water and fuel hoses for wear or damage. See your authorized Yanmar dealer or distributor for replacement.

Checking or Replacing Flexible Engine Mounts

Check the flexible engine mounts for wear or damage. See your authorized Yanmar dealer or distributor for replacement.

Every 500 Hours of Operation

Perform the following maintenance every 500 hours of operation or every 2 years, whichever comes first.

- **Checking the Fuel Pump and Fuel Lines**
- **Draining and Refilling Closed Cooling System (Engine Coolant)**

Checking the Fuel Pump and Fuel Lines

See your authorized Yanmar dealer or distributor.

Draining and Refilling Closed Cooling System (Engine Coolant)

1. Disconnect battery negative (-) cable.
2. Remove the engine cover.
3. Remove the coolant pressure cap from heat exchanger.
4. Remove the heat exchanger to access the cylinder block drain plug behind it.

*Note: The charge air cooler has been removed for clarity of **Figure 10**.*

5. **WARNING! *NEVER remove the coolant filler cap if the engine is hot. Steam and hot engine coolant will escape and seriously burn you. Allow the engine to cool before attempting to remove the filler cap.*** Remove drain plug **(Figure 10, (1))** from the engine block. Allow coolant to drain into a container of appropriate size.

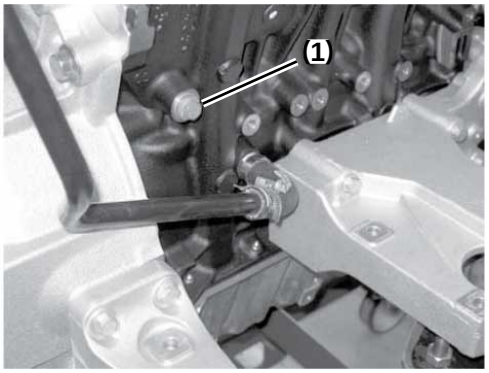

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Figure 10

6. Install cylinder block drain plug with a new gasket.
7. Install heat exchanger. Ensure the drain cock **(Figure 11, (1))** on the heat exchanger is closed.

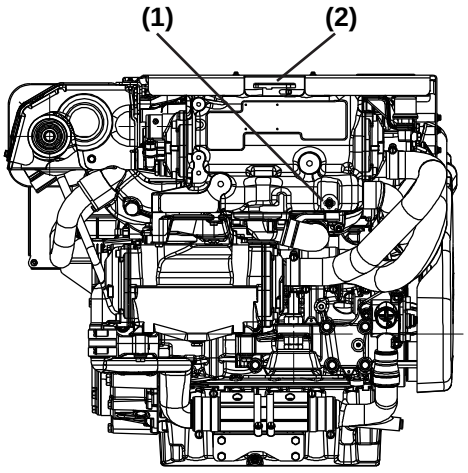

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Figure 11

8. Remove the pressure cap **(Figure 11, (2))** from the heat exchanger.
9. Inspect the cap gasket and flange on the filler neck for damage. Replace if necessary.
10. Check the rubber hose connecting the coolant recovery tank to the heat exchanger. Be sure the hose is securely connected and there is no damage.
11. Fill the heat exchanger and recovery tank with approved coolant mix.*See Adding Engine Coolant on page 32*.

Every 1000 Hours of Operation

Perform the following maintenance every 1000 hours of operation or every 4 years, whichever comes first.

- **Checking Flexible Engine Mounts**

Checking Flexible Engine Mounts

Check flexible engine mounts for damage, cracks or wear. See your authorized Yanmar marine dealer or distributor for replacement.

Every 2000 Hours of Operation

Perform the following maintenance every 2000 hours of operation or every 8 years, whichever comes first.

- **Replacing Seawater Pump Impeller**
- **Replacing Alternator Belt**

Replacing Seawater Pump Impeller

See your authorized Yanmar marine dealer or distributor for replacement.

Replacing Alternator Belt

See your authorized Yanmar marine dealer or distributor for replacement.

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TROUBLESHOOTING

If a problem occurs, stop the engine immediately. Refer to the Problem / Symptom column in the Troubleshooting Chart to identify the problem.

TROUBLESHOOTING INFORMATION

If your engine does not operate properly, refer to the troubleshooting chart or see your authorized Yanmar marine dealer or distributor.

Provide the authorized Yanmar marine dealer or distributor with the following information:

- Model name and serial number of your engine
- Boat name, hull material, size
- Use and type of boating
- Total number of operation hours (refer to hourmeter), age of boat
- Operating conditions when the problem occurred:
  - Engine rpm
  - Color of exhaust smoke
  - Type of diesel fuel
  - Type of engine oil
  - Any abnormal noises or vibration
- Operating environment such as high altitude or extreme ambient temperatures, etc.
- Engine maintenance history and previous problems
- Other factors that contribute to the problem

TROUBLESHOOTING CHART

Starting Trouble

Problem / Symptom	Cause	Action
Engine Will Not Crank	Discharged battery	Charge / replace battery
	Blown fuse	Replace fuse
	Defective starter motor	See your authorized Yanmar dealer or distributor
	Loose wiring connections	Tighten connections
	Electrical panel power circuit breaker is tripped	Reset circuit breaker
Engine Cranks but Will Not Start	No fuel to engine	Check fuel level in tank
		See your authorized Yanmar dealer or distributor
	No fuel to cylinders	Check fuel filter / water separator
		Clean or replace clogged fuel fine filter
		Bleed air from fuel system
		Replace blown fuse (F3)
		See your authorized Yanmar dealer or distributor
	Low ambient temperature	See your authorized Yanmar dealer or distributor
	Oil high	Replace with correct viscosity oil for operating conditions

Exhaust Color

Problem / Symptom	Cause	Action
White Smoke	Cold engine	Allow engine to warm to operating temperature
		See your authorized Yanmar dealer or distributor
	Incorrect fuel	Replace fuel with correct type
	Defective (leaking) fuel injector	See your authorized Yanmar dealer or distributor
	Injection timing is incorrect	
White Smoke with Water Vapor	Leaking cylinder head gasket	See your authorized Yanmar dealer or distributor
	Leaking charge air cooler	
	Cracked cylinder head	
	Cracked cylinder	
Blue Smoke	Worn piston rings / cylinders	See your authorized Yanmar dealer or distributor
	Oil leak in turbocharger (oil present in intake manifold)	
	Damaged piston cooling nozzles	
Black Smoke Under Load	Clogged intake air filter	Replace or clean as necessary
	Incorrect valve timing	See your authorized Yanmar dealer or distributor
	Defective (leaking) fuel injector	
	Low charge air pressure	Clean or replace clogged air filter
		See your authorized Yanmar dealer or distributor
	Excessive exhaust back pressure	See your authorized Yanmar dealer or distributor
	Plugged intake port(s)	See your authorized Yanmar dealer or distributor

Vibration - Drive Disengaged

Problem / Symptom	Cause	Action
Rough at All Engine Speeds	Air in fuel system	Bleed fuel system
	Faulty fuel injector	See your authorized Yanmar dealer or distributor
	Leaking cylinder head gasket	
	Damaged intake or exhaust valves	
	Incorrect injection pressure	

Vibration - Drive Engaged

Problem / Symptom	Cause	Action
Rough at All Speeds	Engine and propeller shaft misaligned	See your authorized Yanmar dealer or distributor
	Leaking cylinder head gasket	
	Bent propeller shaft	
Rough at Higher Speeds	Bent propeller	See your authorized Yanmar dealer or distributor
	Slipping clutch / clutch dog	
	Incorrect injection pressure	
	Injection timing is incorrect	

Engine Knocks

Problem / Symptom	Cause	Action
Excess Fuel Injected	Defective fuel injector	See your authorized Yanmar dealer or distributor
	High fuel injection pressure	
Noise Changes with Engine Load	Incorrect or poor quality fuel	Drain and refill tank with proper fuel
	Worn crankshaft / bearings	See your authorized Yanmar dealer or distributor
	Broken piston / rings	

Low Power Output

Problem / Symptom	Cause	Action
Miscellaneous	Clogged air filter	Replace air filter
	Leaking cylinder head gasket	See your authorized Yanmar dealer or distributor
	Damaged turbocharger	
	Incorrect propeller	
	Excessive exhaust back pressure	
Fuel	Plugged fuel filter(s)	Replace as necessary
	Faulty fuel supply pump	See your authorized Yanmar dealer or distributor
Low Fuel Injection Pressure	Defective fuel pressure regulator / sensor	See your authorized Yanmar dealer or distributor
	Worn high-pressure fuel pump	
	Injection timing is incorrect	
Low RPM at Wide Open Throttle	Propeller pitch too great	See your authorized Yanmar dealer or distributor
	Engine overheated	
	Damaged turbocharger	

Engine Overheat

Problem / Symptom	Cause	Action
Instrument Shows High Temperature	Clogged seawater inlet	Clean
	Low coolant level	Fill with coolant / inspect for leaks
	Clogged seawater filter (if equipped)	Clean
	Clogged hydraulic cooler	See your authorized Yanmar dealer or distributor
	Seawater pump worn or damaged	
	Defective sensor / instrument	
	Defective thermostat	
	Damaged closed coolant pump	
	Combustion gas leakage (causes loss of coolant)	
	Seawater pump belt slips or pump pulley loose on pump shaft	
	Clogged heat exchanger	

Engine Runs Cold

Problem / Symptom	Cause	Action
Instrument Shows Low Temperature	Defective sensor / instrument	See your authorized Yanmar dealer or distributor
	Defective thermostat	
	Cabin heater or boiler too large	

Coolant Loss

Problem / Symptom	Cause	Action
Repeated Low Coolant Level	Defective cylinder head gasket (external leakage)	See your authorized Yanmar dealer or distributor
	External leakage at connection	
Coolant Forced Out of Coolant Recovery Tank	Turbocharging pressure enters cooling system via leaking charge air cooler	See your authorized Yanmar dealer or distributor
	Defective cylinder head gasket (internal leakage)	
White Smoke when Engine Hot Indicates Water Vapor	Crack in cylinder head (not cracks between valve seats)	See your authorized Yanmar dealer or distributor
	Cracked cylinder wall	
	Leaking cylinder head gasket	

DIAGNOSTIC TROUBLE CODES

When certain faults occur, or when certain limits have been exceeded, the engine ECU may generate a “Check Engine” warning or turn on a check engine light (if equipped). Some of these faults may also generate a DTC or Diagnostic Trouble Code and an audible alarm. If a DTC is generated, the engine ECU will store that code or codes for reference. To read the DTC codes, a special tool is used by the technician. The technician then can use a list to more quickly find the cause of the fault and correct it.

Some conditions will produce an alarm but do not generate a trouble code. An example is engine overheat (over 108°C) caused by an obstructed seawater inlet. The overheat alarm will sound and the engine torque will be reduced to protect the engine, but no code will be set.

Under some conditions, the warning alarm will sound until the fault code is checked and corrected. Under other conditions, the alarm will be canceled if the engine is turned off and then restarted.

For further information, please contact your authorized Yanmar distributor or dealer.

Diagnostic Trouble Code Table

Code	Part or System	Mode	Run Or Condition	Engine Can Start	Check Engine Alarm
No Code	Coolant Temp	Under 0°C (32°F)	1000 rpm	yes	no
No Code	Coolant Temp	Over 108°C (226°F)	reduce	yes	no
No Code	Coolant Temp	Over 110°C (230°F)	reduce	yes	alarm
No Code	Charge Air Temp	Over 110°C (230°F)	reduce	yes	no
No Code	Boost Pressure Reading	4BY2 - over 1.9 bar (27.5 psi) (relative*) or 2.9 bar (42.0 psi) (absolute**) 6BY2 - over 2.3 bar (33.3 psi) (relative*) or 3.3 bar (42.9 psi) (absolute**)	reduce	yes	alarm
No Code	Fuel Temperature	Over 90°C (194°F)	reduce	yes	no
No Code	Neutral Switch	Only in case of analog throttle or in case of CAN-fault (U0001), wrong configuration - neutral position	no	no	alarm
P0001	Fuel Metering Unit	Not connected	reduce	yes	alarm
P0003	Fuel Metering Unit	Short circuit to Ground	no	no	alarm
P0004	Fuel Metering Unit	Short circuit to B+	reduce	yes	alarm
P0087	Rail Pressure Governor Deviation	Fuel rail pressure out of range	reduce or shut off	depends on fault	alarm
P0088	Rail Pressure Governor Deviation	Fuel rail pressure out of range	reduce or shut off	depends on fault	alarm
P0089	Rail Pressure Governor Deviation	Fuel rail pressure out of range	yes	yes	alarm
P0090	Fuel Pressure Control Valve	Not connected	no	no	alarm
	Rail Pressure Governor Deviation	Fuel rail pressure out of range	reduce	yes	alarm
P0091	Fuel Pressure Control Valve	Short circuit to Ground	reduce	yes	alarm
P0092	Fuel Pressure Control Valve	Short circuit to B+	no	no	alarm
P0112	Charge Air Temp	Over 125°C (257°F)	reduce	yes	alarm
	Charge Air Temp Sensor	Short circuit to B+	reduce	yes	alarm
P0113	Charge Air Temp	Under -20°C (-4°F)	reduce	yes	alarm
	Charge Air Temp Sensor	No connection / short circuit to Ground	reduce	yes	alarm
P0117	Coolant Temp Sensor	Short circuit to B+	reduce	yes	alarm
P0118	Coolant Temp Sensor	No connection / short circuit to Ground	reduce	yes	alarm

Code	Part or System	Mode	Run Or Condition	Engine Can Start	Check Engine Alarm
P0122	Throttle Signal	Both throttle signals are missing / short circuit to Ground	1600	yes	alarm
	Throttle Signal	Throttle signal 1 is missing / short circuit to Ground	reduce	yes	alarm
P0123	Throttle Signal	Both throttle signals are short circuited to B+	1600	yes	alarm
	Throttle Signal	Throttle signal 1 short circuit to B+	reduce	yes	alarm
P0182	Fuel Temperature Sensor	Short circuit to B+	reduce	yes	alarm
P0183	Fuel Temperature Sensor	No connection / short circuit to Ground	reduce	yes	alarm
P0192	Fuel Rail Pressure Sensor	Short circuit to Ground	reduce	yes	alarm
P0193	Fuel Rail Pressure Sensor	No connection / short circuit B+	reduce	yes	alarm
P0201	Injector No. 1	Open circuit / short circuit to Ground	reduce	yes	alarm
P0202	Injector No. 2	Open circuit / short circuit to Ground	reduce	yes	alarm
P0203	Injector No. 3	Open circuit / short circuit to Ground	reduce	yes	alarm
P0204	Injector No. 4	Open circuit / short circuit to Ground	reduce	yes	alarm
P0205	Injector No. 5	Open circuit / short circuit to Ground	reduce	yes	alarm
P0206	Injector No. 6	Open circuit / short circuit to Ground	reduce	yes	alarm
P0222	Throttle Signal	Both throttle signals are missing / short circuit to Ground	1600	yes	alarm
	Throttle Signal	Throttle signal 2 is missing / short circuit to Ground	reduce	yes	alarm
P0223	Throttle Signal	Both throttle signals are short circuited to B+	1600	yes	alarm
	Throttle Signal	Throttle signal 2 short circuited to B+	reduce	yes	alarm
P0230	Fuel Feed Pump	Not connected	no	no	alarm
P0231	Fuel Feed Pump	Short circuit to Ground	reduce	yes	alarm
P0232	Fuel Feed Pump	Short circuit to B+	no	no	alarm
P0236	Boost Pressure	Plausibility check with APS (ambient air pressure sensor) fail	reduce	yes	alarm
P0237	Boost Pressure	Under 0.5 bar (7.3 psi) (absolute**)	reduce	yes	alarm
	Boost Pressure Sensor	No connection / short circuit to Ground	reduce	yes	alarm

Code	Part or System	Mode	Run Or Condition	Engine Can Start	Check Engine Alarm
P0238	Boost Pressure	4 bar (58.0 psi) (absolute**)	reduce	yes	alarm
	Boost Pressure Sensor	Short circuit to B+	reduce	yes	alarm
P0243	Turbocharger Positive Boost Pressure Deviation	Leakage in the air routing (hole in the charge air pipe)	yes	yes	alarm
P0261	Injector No. 1	Short circuit to B+	reduce	yes	alarm
P0264	Injector No. 2	Short circuit to B+	reduce	yes	alarm
P0267	Injector No. 3	Short circuit to B+	reduce	yes	alarm
P0270	Injector No. 4	Short circuit to B+	reduce	yes	alarm
P0273	Injector No. 5	Short circuit to B+	reduce	yes	alarm
P0276	Injector No. 6	Short circuit to B+	reduce	yes	alarm
P0299	Turbocharger negative boost pressure deviation	Boost pressure actuator is sticking defect waste gate hose	yes	yes	alarm
P0344	Crankshaft Speed Sensor	Disagreement between camshaft speed sensor and crankshaft speed sensor	no	no	alarm
P0380	Glow Control Relay Actuator	Not connected, short circuit	yes	yes	alarm
P0562	System Voltage Low	-	yes	no	alarm
P0563	System Voltage High	-	yes	yes	alarm
P0602	Control Module Programming Error (Hwemon)	Overvoltage / undervoltage	no	no	alarm
	Shut Off Path	Control module programming error	no	no	alarm
P0607	Injector Chip Fault	Injector control module performance	no	no	alarm
P0642	Sensor Supply Monitoring 1	Short circuit	reduce	yes	alarm
P0643	Sensor Supply Monitoring 1	Short circuit	reduce	yes	alarm
P0650	Check Engine Lamp	Not connected, short circuit	yes	yes	alarm
P0652	Sensor Supply Monitoring 2	Short circuit	reduce	yes	alarm
P0653	Sensor Supply Monitoring 3	Short circuit	reduce	yes	alarm
P0670	Glow Plug Control Module	Failure, short circuit, over-current	yes	yes	alarm
P0671	Glow System - Glow Spark No. 1	Not connected, short circuit	yes	yes	alarm
P0672	Glow System - Glow Spark No. 2	Not connected, short circuit	yes	yes	alarm
P0673	Glow System - Glow Spark No. 3	Not connected, short circuit	yes	yes	alarm
P0674	Glow System - Glow Spark No. 4	Not connected, short circuit	yes	yes	alarm

Code	Part or System	Mode	Run Or Condition	Engine Can Start	Check Engine Alarm
P0675	Glow System - Glow Spark No. 5	Not connected, short circuit	yes	yes	alarm
P0676	Glow System - Glow Spark No. 6	Not connected, short circuit	yes	yes	alarm
P0689	Main Relay	Power relay sense short circuit low	no	no	alarm
P0690	Main Relay	Power relay sense short circuit high	no	no	alarm
P2049	4BY2 - Injector Bank 1	Short circuit on high side to Ground / B+	no	no	alarm
	6BY2 - Injector Bank 1	Short circuit on high side to Ground / B+	reduce	no	
P2052	4BY2 - Injector Bank 2	Short circuit on high side to Ground / B+	reduce	yes	alarm
	6BY2 - Injector Bank 2	Short circuit on high side to Ground / B+	reduce	yes	
P2227	Atmospheric Pressure	Plausibility check with BPS (boost pressure sensor) fail	yes	yes	alarm
P2228	Atmospheric Pressure	Short circuit low	yes	yes	alarm
P2229	Atmospheric Pressure	Short circuit high	yes	yes	alarm
P2614	Camshaft Speed Sensor	No connection / short circuit	reduce	yes	alarm
P2617	Crankshaft Speed Sensor	No connection / short circuit	no	no	alarm
U0001	CAN Throttle Signal	No signal	idle	yes	alarm
U0106	Glow Control Unit	No communication error	yes	yes	alarm
U0426	Immobilizer	Manipulation error	no	no	alarm

* Relative value is the value read on a pressure gauge attached to the intake pipe.
** Absolute is the value reported by the ECU and displayed at the helm digital display.

LONG-TERM STORAGE

If the engine is not to be used for an extended period of time, special measures should be taken to protect the coolant system, fuel system and combustion chambers from corrosion and the exterior from rusting. It is recommended that you see your authorized Yanmar marine dealer or distributor to prepare the engine for long-term storage.

The engine can normally stand idle for up to six months. If it remains unused for longer than this, please contact your authorized Yanmar marine dealer or distributor.

Winter Storage

Drain water from fuel tank and fuel filters before and after extended storage.

To reduce the risk of condensation in the fuel tank during winter storage, fill the tank with fuel and treat with diesel fuel stabilizer.

PREPARE ENGINE FOR LONG-TERM STORAGE

NOTICE: *Do not drain closed cooling system for long-term storage. Antifreeze must be used to avoid freezing and damaging of components. Antifreeze will prevent rusting during long-term storage.*

1. Change engine oil and filter.
2. Drain seawater cooling system. *See Draining the Seawater Cooling System on page 70*.
3. Wipe off any dust or oil from the outside of the engine.
4. Drain fuel tank or fill the tank to prevent condensation.
5. Grease the exposed areas and joints of the remote control cables and the bearings of the remote control handle.
6. Seal the intake silencer, exhaust pipe, etc. to prevent moisture or contamination from entering engine.
7. Completely drain bilge in hull bottom.
8. Waterproof the engine room to prevent rain or seawater from entering.
9. Charge the battery once a month to compensate for battery's self-discharge.
10. Remove key from key switch and cover key switch with moisture cap (if equipped).

Draining the Seawater Cooling System

CAUTION! ***DO NOT drain the coolant system. A full coolant system will prevent corrosion and frost damage.***

CAUTION! ***If seawater is left inside of the engine, it may freeze and damage parts of the cooling system when the ambient temperature is below 0°C (32°F).***

NOTICE: *If water fails to drain from any open drain cock or port, remove the cock completely and probe the opening with a small piece of wire to loosen debris.*

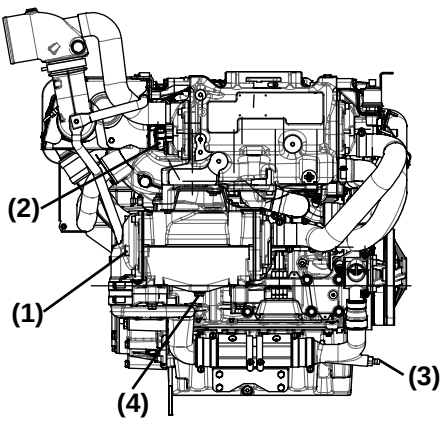

Figure 1

WARNING! ***NEVER drain the seawater cooling system if the engine is hot. Steam and hot fluid will escape and seriously burn you. Allow the engine to cool before attempting to opening the drain cocks.***

1. Open the lower seawater drain cock **(Figure 1, (3))** located in the piping between the seawater pump and hydraulic oil cooler. Allow to drain.
2. Open the drain cock **(Figure 1, (4))** on the bottom of the charge air cooler.
3. Remove the seawater pump cover. See your authorized Yanmar dealer or distributor.
4. Remove zinc anodes from the heat exchanger **(Figure 1, (2))** and charge air cooler **(Figure 1, (1))** and allow water to drain from housings.
5. Inspect condition of zinc anodes. Install anodes. *See Replacing the Zinc Anodes on page 53*. NOTICE: *Do not use thread sealer or thread sealing tape when installing zinc anodes. Anodes must make good metal-to-metal contact to perform properly.*
6. Close all drain cocks.

SPECIFICATIONS

ENGINE SPECIFICATIONS

Engine Model	4BY2-150 / 150Z	4BY2-180 / 180Z	6BY2-220 / 220Z	6BY2-260 / 260Z
Application Design	Models numbers with no suffix letter are used in marine gear applications. Models having a “Z” suffix are used with stern drive.			
Number of Cylinders	In-line 4		In-line 6	
Type	15° inclined, water-cooled, dual overhead camshaft, 4-cycle diesel			
Combustion System	Direct injection			
Aspiration	Turbocharged with charge air cooler			
Bore x Stroke	84 mm x 90 mm (3.307 in. x 3.543 in.)			
Displacement	1.995 L (122 cu in.)		2.993 L (183 cu in.)	
Firing Order*	1-3-4-2		1-5-3-6-2-4	
Compression Ratio	16.5:1		16.5:1	
Maximum Output at Crankshaft**				
kW (metric hp) at 4000 rpm	110 kW (150 hp)	132 kW (180 hp)	162 kW (220 hp)	191 kW (260 hp)
Mean Pressure	1.66 MPa (240.8 psi)	1.95 MPa (287.2 psi)	1.62 MPa (234.96 psi)	1.92 MPa (278.47 psi)
Torque	320 N·m (236 ft-lb)	360 N·m (265 ft-lb)	500 N·m (369 ft-lb)	550 N·m (407 ft-lb)
Low Idle Speed (Warm Engine @ 88°C [190°F])	750 rpm (ECU-controlled) ***		670 rpm (ECU-controlled) ***	
Cold Start Speed @ 20˚ °C (68°F)	1200 rpm gradually decreasing to warm engine idle @ 88°C (190°F) (ECU-controlled)			
High Idle Speed	4600 rpm			
Rotation Direction	Counterclockwise (viewed from flywheel)			
No. of Valves per Cylinder	4			
Valve Adjustment	Hydraulic self-adjusting			
Turbocharger	MHI with pneumatic wastegate		HOLSET with pneumatic wastegate	
Charge Air Cooler	Seawater cooled			
Electrical System	12 V			
Starter	12 V / 2 kW (2.7 hp)			
Charging System	12 V / 150 A			
Battery Capacity - Recommended	12 V / 85 Ah / 680 CCA (cold cranking amps)			

SPECIFICATIONS

Engine Model	4BY2-150 / 150Z	4BY2-180 / 180Z	6BY2-220 / 220Z	6BY2-260 / 260Z
Fuel Injection System	Common rail (ECU-controlled)			
Fuel Injection Pressure	Variable depending on rpm; 250 - 1600 bar (3626 - 23,206 psi)			
Injection Timing	Variable (ECU controlled)			
ECU Threshold Voltage	7.8 V			
Cooling System	Closed cooling system with seawater heat exchanger			
Coolant Capacity (Approximate)	10 L (10.6 qt)		13 L (13.7 qt)	
Seawater Pump	Rubber impeller, belt driven			
Capacity	165 L/min at maximum rating			
Maximum Lift	2000 mm (78.75 in.)			
Hydraulic Oil Cooler	Seawater cooled			
Lubrication System	Totally enclosed, forced lube system			
Oil Cooler	Engine coolant system			
Engine Oil Pressure at 4000 rpm	3.5 - 6.0 bar (51 - 87 psi)			
Engine Oil Pressure at 1000 rpm	0.6 - 1.0 bar (8.7 - 14.5 psi)			
Engine Oil Capacity****	8.0 L (8.5 qt)*****		11.0 L (11.5 qt)*****	
Crankcase Ventilation	Closed, with filter			
Drive Options				
Stern Drive	ZT350 or MerCruiser Bravo-1, -2, -3			
Marine Gear	KMH40 or KMH50		KMH50	
Operational Angles				
Continuous	Front-to-Rear: -5 to 20°, Side-to-Side: 20°			
Peak	Front-to-Rear: -5 to 25°, Side-to-Side: 30°			
Height	721 mm (28.4 in.)			
Length (without marine gear)				
Stern Drive (front-to-middle of engine mount)	736.5 mm (30.0 in.)		942 mm (37.1 in.)	
Marine Gear (front-to-marine gear mounting face)	644 mm (25.4 in.)		827.5 mm (32.6in.)	
Overall Length	839.2 mm (33.0 in.)		1001 mm (39.4 in.)	
Width	670 mm (26.4 in.) (local exceeding)			

Engine Model		4BY2-150 / 150Z	4BY2-180 / 180Z	6BY2-220 / 220Z	6BY2-260 / 260Z
Weight (without marine gear)					
	Dry (without mixing elbow)	For Stern Drive: 273.5 kg (603 lb) For Marine Gear: 262.5 kg (575.7 lb)		For Stern Drive: 338 kg (745 lb) For Marine Gear: 319 kg (703 lb)	

* Cylinder numbering starts at the coolant pump end of the engine.

** Rating condition: ISO 8665. Temperature of fuel: 40°C (104°F) at fuel pump inlet 1 hp (metric horsepower) = 0.7355 kW Fuel condition: Density at 15°C (59°F) = 0.840 g/cm^3 Fuel temperature at the inlet of the fuel injection pump

*** 1080 rpm at startup for alternator excitation

**** The “Total Engine Lubricating Oil Capacity” includes oil in the oil pan, channels, coolers, and filter. The “Effective Engine Lubricating Capacity” indicates the difference in maximum scale of the dipstick and minimum scale.

***** Capacity may vary depending on installation angle.

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EPA WARRANTY
USA ONLY

YANMAR CO., LTD. LIMITED EMISSION CONTROL SYSTEM WARRANTY - USA ONLY

The following EPA Warranty only applies to engines built on or after January 01, 2006 and labeled with the proper nameplate.

THIS EMISSION WARRANTY APPLIES TO THE ENGINES CERTIFIED TO UNITED STATES EPA 40 CFR 94 AND SOLD BY YANMAR THAT ARE INSTALLED IN VESSELS FLAGGED OR REGISTERED IN THE UNITED STATES.

Your Warranty Rights and Obligations:

Yanmar warrants to the first user and each subsequent purchaser the emission control system on your engine for periods of time listed below provided the engine has been installed according to Yanmar installation requirements and there has been no abuse, neglect, or improper maintenance of your Yanmar marine engine.

Yanmar warrants that the engine is designed, built and tested using genuine parts and equipped so as to conform to all applicable emission requirements of the U.S. Environmental Protection Agency and is free from defects in material and workmanship which would cause this engine to fail to conform to the applicable emission regulations over its limited emission control system warranty period.

Where a warrantable emissions condition exists, Yanmar will repair your engine at no charge to you for diagnosis, parts, and labor. Warranty service or repair will be provided at authorized Yanmar marine dealers or distributors.

It is recommended that any replacement parts used for maintenance, repair or replacement of emission control systems are Yanmar parts. The owner may elect to have maintenance, replacement or repair of the emission control components and systems performed by any repair establishment or individual and may elect to use parts other than Yanmar parts for such maintenance, replacement or repair. However, the cost of such service or parts and subsequent failures from such service or parts will not be covered under this emission control system warranty:

Warranty Period:

The warranty starts on either the date of delivery to the first end-user, or the date the unit is first leased, rented, or loaned.

For Pleasure Use: The warranty period is **five (5) years** or **2000 hours** of use, whichever occurs first. In the absence of a device to measure hours of use, the engine has a warranty period of **five (5) years**.

Warranty Coverage:

Repair or replacement of any warranted parts will be performed at an authorized Yanmar dealer or distributor. This limited emission control system warranty covers engine components that are a part of the emission control system of the engine as delivered by Yanmar to the original retail purchaser. Such components may include the following:

1. Fuel Injection System
2. Turbocharger System
3. Aftercooler
4. Electronic Engine Control Units and its associated Sensor and Actuators

Exclusions:

Failures other than those arising from defects in material and / or workmanship are not covered by this limited emissions warranty. This warranty does not extend to the following: malfunction caused by abuse, misuse, improper adjustment, modification, alteration, tampering, disconnection, improper or inadequate maintenance, improper storage or use of non-recommended fuels and lubricating oils, accident-caused damage, and replacement of expendable and / or consumable items made in connection with scheduled maintenance.

Owner's Responsibility:

As the Yanmar marine engine owner, you are responsible for the performance of the required maintenance listed in your *Operation Manual*. Yanmar recommends that you retain all documentation, including receipts, covering maintenance on your marine engine, but Yanmar cannot deny warranty solely for the lack of receipts or for your failure to ensure the performance of all scheduled maintenance.

Your engine is designed to operate on diesel fuel only. Use of any other fuel may result in your engine no longer operating in compliance with applicable emission requirements. You are responsible for initiating the warranty process. You must present your marine engine to an authorized Yanmar dealer or distributor as soon as a problem exists.

Customer Assistance:

If you have any questions regarding your warranty rights and responsibilities or would like information on the nearest authorized Yanmar dealer or distributor, you should contact Yanmar Marine USA Corporation for assistance.

Yanmar Marine USA Corporation
101 International Parkway
Adairsville, GA 30103
USA Telephone: 770-877-9894
Fax: 770-877-7567

Maintenance Log

Date	Operating Hours	Maintenance Performed	Dealer Name	Stamp or Signa-ture

Date	Operating Hours	Maintenance Performed	Dealer Name	Stamp or Signature

Declaration of Conformity for Recreational Craft Propulsion Engine with the Exhaust and Noise emission requirements of Directive 94/25/EC as amended by 2003/44/EC

(To be completed by manufacturer of outboard or inboard engines with integral exhaust)

Name of engine manufacturer: Yanmar Co., Ltd.

Street: 1-32 **Town:** Chayamati, Kitaku, Osaka-City

Post Code: 530-8311 **Country:** Japan

Name of Authorised Representative (if applicable)**:** Yanmar Marine International B.V.

Street: Brugplein 11 **Town:** Almere-de Vaart

Post Code: 1332 BS **Country:** The Netherlands

Name of Notified Body for exhaust emission assessment: Germanischer Lloyd

Street: Vorsetzen 32/35 **Town:** Hamburg

Post Code: 20459 **Country:** Germany **ID Number:** 0098

Name of Notified Body for noise emission assessment: DCI Dutch Certificate Institute

Street: Nipkowweg 9 **Town:** Joure

Post Code: 8500 AB **Country:** The Netherlands **ID Number:** 0613

Module used for exhaust emission assessment: B+C ☐ B+D ☒ B+E ☐ B+F ☐ G ☐ H ☐
or engine type-approved according to: ☐ stage II of Directive 97/68/EC ☐ Directive 88/77/EC

Module used for noise emission assessment: Aa ☒ G ☐ H ☐

Other Community Directives applied: 2004/108/EC

DESCRIPTION OF ENGINE(s) AND ESSENTIAL REQUIERMENTS

Engine Type:
☒ Inboard engine
☒ z or sterndrive with integral exhaust

Fuel Type:
☒ Diesel
☐ Petrol

Combusion cycle:
☐ 2 stroke
☒ 4 stroke

Essential requirements	Standards Used	Other normative document used	See technical file
Annex I.B – Exhaust Emissions			
engine identification (I.B.1)			☐
exhaust emission requirements	EN ISO 8178-1:1996		☒
durability			☐
owner's manual			☐
Annex I.C – Noise Emissions			
Noise emission levels (I.C.1)	EN ISO 14509		☒
owner's manual (I.C.2)			☐

ENGINE(S) COVERED BY THIS DECLARATION

Engine model(s) or engine family name(s):	EC Type certificate number (exhaust)
Family name BY	35626-06 HH
Model name	
4BY150Z	
4BY180Z	
6BY220Z	
6BY260Z	
4BY2-150Z	
4BY2-180Z	
6BY2-220Z	
6BY2-260Z	

I declare on behalf of the engine manufacturer that the engine(s) mentioned above complie(s) with all applicable essential requirements in the way specified and is in conformity with the type for which above mentioned EC type examination certificate(s) has been issued.

Name: Mitsuo Kaji
(identification of the person empowered to sign on behalf of the engine manufacturer or his authorised representative)

Signature and title: M. Kaji (or an equivalent marking)
Senior Manager
YMI Development Dept.
Development Dept.
Marine Operations Dept.
Yanmar Co. Ltd.

Date: (yr/month/day) 2009 / 01 / 15

Declaration of Conformity for Recreational Craft Propulsion Engine with the Exhaust emission requirements of Directive 94/25/EC as amended by 2003/44/EC

(To be completed by manufacturer of inboard engines without integral exhaust)

Name of engine manufacturer: Yanmar Co., Ltd.

Street: 1-32 **Town:** Chayamachi, Kitaku, Osaka-City

Post Code: 530-8311 **Country:** Japan

Name of Authorised Representative: Yanmar Marine International B.V.

Street: Brugplein 11 **Town:** Almere-de Vaart

Post Code: 1332 BS **Country:** The Netherlands

Name of Notified Body for exhaust emission assessment: Germanisher Lloyd

Street: Vorsetzen 32/35 **Town:** Hamburg

Post Code: 20459 **Country:** Germany **ID Number:** 0098

Module used for exhaust emission assessment: ☐ B+C ☒ B+D ☐ B+E ☐ B+F ☐ G ☐ H

or engine type-approved according to: ☐ stage II of Directive 97/68/EC ☐ Directive 88/77/EC

Other Community Directives applied: 89/336/EEC

DESCRIPTION OF ENGINE(s) AND ESSENTIAL REQUIERMENTS

Engine Type:
- ☐ z or sterndrive without integral exhaust
- ☒ Inboard engine

Fuel Type:
- ☒ Diesel
- ☐ Petrol

Combustion cycle:
- ☐ 2 stroke
- ☒ 4 stroke

Essential requirements	Standards Used	Other normative document used	See technical file
Annex I.B – Exhaust Emissions			
engine identification			
exhaust emission requirements	EN ISO 8178-1:1996		X
durability			
owner's manual			
Annex I.C – Noise Emissions	see craft manufacturer's Declaration of Conformity		

ENGINE(S) COVERED BY THIS DECLARATION

Engine model(s) or engine family name(s):	EC Type certificate number (exhaust)
Engine family name	35626-06 HH
Model name	
4BY150(Z)	
4BY180(Z)	
4BY180V	
6BY220(Z)	
6BY260(Z)	
6BY260V	
4BY2-150(Z)	
4BY2-180(Z)	
4BY2-180V	
6BY2-220(Z)	
6BY2-260(Z)	
6BY2-260V	

I declare on behalf of the engine manufacturer that the engine(s) will meet the exhaust emission requirements of Directive 94/25/EC as amended by Directive 2003/44/EC when installed in a recreational craft, in accordance with the engine manufacturer's supplied instructions and that this (these) engine(s) must not be put into service until the recreational craft into which it is (they are) to be installed has been declared in conformity with the relevant provisions of the above mentioned Directive.

Name: Mitsuo Kaji
(identification of the person empowered to sign on behalf of the engine manufacturer or his authorised representative)

Signature and title: (or an equivalent marking)

M. Kaji

Senior manager
YMI Development Dept.
Development Dept.
Marine Operations Dept.
Yanmar Co.,Ltd.

Date: (yr/month/day) 2008 / 9 / 10

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